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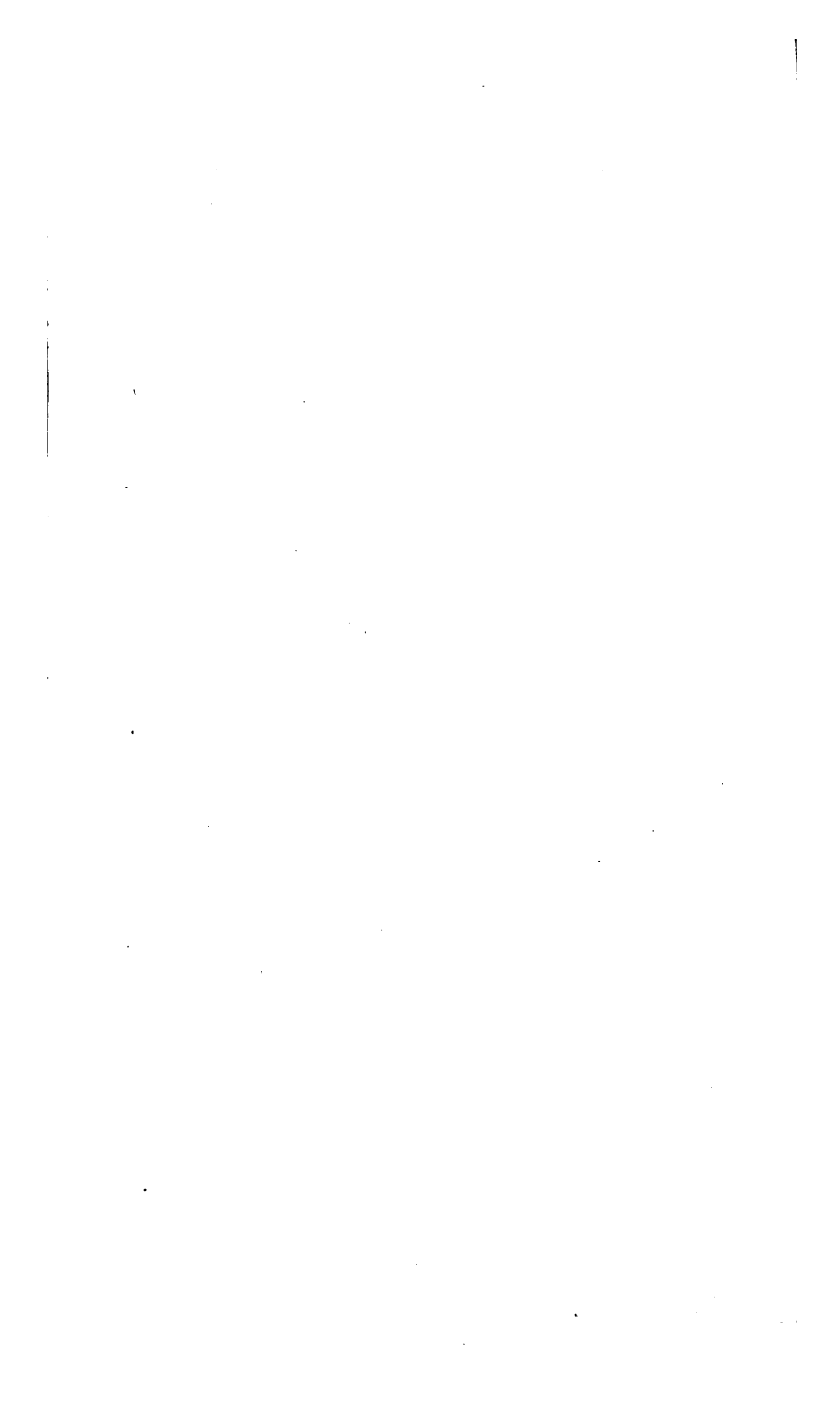
Charles Eliot Professor of Landscape Architecture



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THE
PRACTICAL PLANTER,

OR,
A TREATISE
ON
FOREST PLANTING:

COMPREHENDING THE
CULTURE AND MANAGEMENT

OF
PLANTED AND NATURAL TIMBER,

IN EVERY STAGE OF ITS GROWTH:

ALSO ON THE
CULTURE AND MANAGEMENT OF HEDGE FENCES,

AND THE
CONSTRUCTION OF STONE WALLS, &c.

Second Edition:
CORRECTED AND IMPROVED.

By WALTER NICOL,

Author of "The Forcing, Fruit, and Kitchen Gardener;" an "Essay on Gardening," drawn up by
Desire, and for Consideration of the Board of Agriculture; and Member of the Nat. Hist. Society of
Edinburgh.

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INTRODUCTORY VIEW

OF THE

SUBJECTS.

WHOEVER shall give himself the trouble to look over the contents of this work, will perceive that the SUBJECT, taken in the general, is *far* from being *unimportant*. Perhaps no RURAL TOPIC is, at the present time, *more worthy of attention* ; whether considered in a *private*, or in a *national* point of view. I shall not, therefore, apologize for presuming to solicit the Reader's attention to what, perhaps, *he may be much interested in* ; because, according to the common phrase, there have already been so many books written on the subject. On the

contrary, I conceive it the duty of *every one who has got a mite to offer*, of *useful information*, to do so cheerfully, and without restraint.

Whether information, useful, new, or *interesting*, shall be found by perusal of the following sheets, is a question to be solved by the Reader only. Nor shall I make any protestations of the matter, the practice, and the merit being *all my own* ; or that I have gathered them from *Millar*, from *Evelyn*, from *Hanbury*, or even from *Marshall* ; whom I view with an eye of sincere regard and esteem. I wish to detract from the merit of none ; nor do I wish to assume *that* which may not be thought my due.

In the *first* general head, the subject embraces, and dwells on the different *situations* adapted for the rearing of FOREST TIMBER. The importance of rearing *ship timber* in maritime districts, and in those through which navigable rivers, canals, &c. pass, is particularly pointed out ; and a sketch

given of the kinds most proper to be reared in such situations. The most *rational* means of producing *artificial shelter*, in the rearing of young timber in *bleak exposures*, and BY THE MARGIN OF THE DEEP, is set forth ; and the propriety of planting *waste lands* so situated, pointed out.

The subject turns, in the *second* general head, on the various SOILS adapted to *forest trees*. Here a view is taken of the different kinds of soils ; and their composition, texture, admixture, kinds of upper strata, sub-strata, &c. remarked ; the soils *most particularly* fitted for the different kinds of trees, with those on which they will thrive *comparatively*, is then shewn : and also a general view of the value, *as timber*, of each particular tree ; with the effect the soil, in which they grow, has on *that value*. The *use* to which the particular kinds are generally appropriated, is likewise detailed.

The *third* general head contains the method of nursing *seedling* forest trees for EX-

TENSIVE DESIGNS. Here, I first premise, *that it is no saving for any gentleman to rear his own nursery from seed* ; although he may profit, in a double point of view, by nursing *seedlings* in this particular case. I afterwards endeavour to investigate and solve the very commonly-agitated question, Whether trees should be nursed on SOIL and in SITUATIONS corresponding with *those* on which they are *ultimately* to be planted ?

I then point out the soil, situation, manner of preparing, and otherwise improving a nursery fit for the purpose in view ; together with *the rotation of crops*, when occupied, as advised, in the double capacity of *kitchen and nursery ground*. After which, I proceed to state the most simple method of *culture* for each kind, with the season of planting, training, &c.

PLANTING, and the management of new plantations, constitutes the *fourth* general division ; in which I am particular throughout—On clearing, draining, ploughing, har-

rowing, pitting, and otherwise preparing the ground—respecting the *age* and *size* of the different kinds to be planted, according to soil, situation, locality, &c.; in which I endeavour to place *in a just light*, the absurdity of planting with *too large* plants, and the unnecessary expence incurred thereby; with a proof that *young* will surpass the *old* plants, in *any* situation, within the seventh year.

The *DISTANCE* at which young timber trees should be planted, according to situation, soil, the size and extent of the plantation, is then remarked, and an attempt made to illustrate these important points. After which, I proceed to the *mixture* of the different kinds, their *relative situations*, those esteemed *fittest nurses*, &c. Here the propriety of planting *in mixture*, and *in groupes*, is considered. The relative situation of the plants, whether in respect to *each other*, or in respect to the locality in the site to be planted, is stated: also, *the supposed antipathy between trees* is investigated; and the

propriety of planting *nurse-plants*, with the kinds *most valuable* for that purpose, illustrated.

I next proceed to remark *the proper season* and manner of performing the *important operation of planting*; stating the most effectual and simple methods *for insuring success*, according to existing circumstances. The method of *sowing acorns among planted timber trees*, by which, I presume, *the best oak-lings* are reared, is shewn; and the most rational mode of *culture*, whether by the hoe, or by otherwise destroying noxious weeds or plants, until the trees be no longer subject to injury.

The consideration of *Training, Pruning, Thinning*; the treatment of *Wounds, Bruises, &c.* come next under view. Here I endeavour to set forth, in the most plain and rational manner, the methods of TRAINING TIMBER FOR USEFUL PURPOSES; for *straight-timber*,—for *crooked-timber* in naval architecture; for manufactures; for machinery;

for the purposes of husbandry ; for fuel : Of THINNING the Plantation *in every stage*, according to local circumstances ; and of the *necessary care* of all *wounds and bruises*, whether occasioned by the operation of pruning, or by incidental casualties.

The *fifth* general head comprehends the planting of HEDGE-ROW AND DETACHED TREES ; wherein is considered the *propriety* of planting such—in *pasture fields*, in *corn lands*, by the sides of *public roads*, in *parks*, or in *lawns*. I also dwell on the method of nursing and preparing them for removal ; *raising*, transplanting, and pruning them *for use, for beauty*. Some observations, on the barbarity of *polling*, &c. I wish not to pass unnoticed.

In the *sixth* general division, I endeavour to point out *the advantages, and the disadvantages* proceeding from the care, or from the neglect of *old plantations*. The necessary *caution* in proceeding to prune and thin those neglected, overrun, or maltreated, according to the *present state or local situation* of the

X **INTRODUCTORY VIEW.**

plantation, is pointed out ; and also, the *evil* consequences proceeding from the *rash* performance of *that duty*, whether in respect of the injury done by *injudicious pruning*, or by the *bad* effects of prevailing winds.

I then proceed to treat of the manner of thinning and pruning MIXED PLANTATIONS under *ten years old* ; from *ten to twenty* years old ; from *twenty to forty* years old ; of *fifty years old and upwards* ; plantations of *Scotch fir*, of all ages ; and HEDGE-ROW TIMBER which has been neglected or maltreated : endeavouring to point out the most speedy and effectual methods of RECLAIMING AND TURNING THEM TO PROFIT.

The subject, in the *seventh* general division, turns on the manner of *cutting and thinning natural woods and copses*. Here are set forth the methods of *cutting in hags* ; of manufacturing the barks of oak and birch ; of speedily REDUCING COPSES OF OAK INTO TIMBER GROVES, for NAVAL and other purposes ; of producing, in natural woods, regular crops of *underwood*, at the same time

RETAINING AND TRAINING TO PROFIT the *timber-stands* ; and, of *dressing up old timbers* frequently found in natural woods, so as to make them become *more valuable* in the character of SHIP TIMBER, particularly for *ribs and knees*.

In the *eighth* general head, I point out the good effects of SUBDIVIDING BARREN, STERILE TRACTS, whether of corn or pasture lands, by belts, stripes, &c. of tree plantations ; and also endeavour to shew the advantages *such lands* might derive from being *properly* thus subdivided ; and *how much* the climate might thereby be *improved*, at the expense of, perhaps, *little valuable land*. *Some considerations*, worthy the attention of every improver, are then stated.

In the *ninth* general head, a cursory view is taken of THE VALUE OF FOREST TIMBER to the individual, and to the nation at large. To this subject, the attention of *the landed interest*, of the true PATRIOT, and the lover of his country, is particularly requested.

In the *tenth and last* general head, I endeavour to set forth, not only the *importance of properly fencing in plantations*, but a few rational methods of rearing new, and of *training, reclaiming*, or otherwise improving *old fences*, so as to make them continue durable. The methods of building and coping *stone walls*, and of building *mud and turf walls*, are also exemplified; with some remarks concerning a certain district lying between the river Spey and the Murray Frith; which, however, are applicable *to the far greater part of Scotland*.

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THE
PRACTICAL PLANTER.

CHAP. I.

THE VARIOUS SITUATIONS WHEREON FOREST TIMBER
MAY BE ADVANTAGEOUSLY CULTIVATED.

SECTION I.

High, Bleak, Mountainous, Inland Situations.

THAT shelter is, in a great measure, essential to the welfare of all newly planted trees, will readily be admitted by every one conversant on the subject of planting; nothing being more prejudicial, till the plant is established in its new situation, than *wind-waving*; which, by loosening the old, and frequently breaking the new fibres, contributes to stint the whole tree in growth.

Hence, the situation, now under view,

would appear to be the most difficult on which young timber may be reared; yet, by strictly attending to *three* points, success may be equally sure, though slower, in this, as in any other. These are, *first*, to choose kinds which will ultimately become valuable; *secondly*, to plant *thickly*, and with *small plants*; and *thirdly*, to plant a mass of considerable extent and width together.

Experience shows, that planting improper kinds, *large plants*, *thin*, and in small quantities together, is spending much time and money in vain. But, by planting as above described, two grand points are obtained; first, an artificial shelter is, in some measure, produced; and the plants are inured to their situation from infancy.

On very high, bleak mountains, which are intended to be covered from the base to the summit, and where success in rearing timber may be doubtful, the most effectual mode of producing *artificial shelter*, is to divide the mountain into so many zones or belts, according to convenience; planting *that* nearest the base first, and so on until the summit is gained.

The propriety of this method will appear manifest, when it is considered, that the gust or current of wind is generally much stronger on the summit than on any other part of the mountain. When two mountains, or steeps, nearly approach each other, and form a hollow or dell between them, the wind, in that case, passes as if through a funnel, and perhaps with greater force than over the summit. If there is a choice, occasioned by the wind continuing to blow *more* one way than another, that part of the zone *most opposed* should be *first* planted.

If the zone shall ~~be~~ so extended that it cannot be *all* planted in one, or even in two or three seasons, so much the better for the purpose; for it would be imprudent to begin with the second zone till the trees of the first were a few years in the ground, and beginning to afford shelter to those of the next. Being divided in length, and part being planted year by year, answers a two-fold purpose; as the trees are rising in succession to one another in *all* directions. The breadth of the zones, in this case, should not be less than *a hundred yards*; but they may be

made as much more in breadth, as convenience, and the desire of having the original design speedily accomplished, may determine.

In other bleak, but *less hilly*, or elevated situations, and where the intended *mass of planting* may be greater than can be accomplished in one or two seasons, *artificial shelter* may also be produced to each portion, except the first; which, the better to answer this purpose, should be situated *either in the centre or the quarter of the field most exposed to the wind*, as determined by observation of *from what point, and with what effect* it generally blows. The first portion to be planted, in this case, should be of considerable extent, that is, of *several acres*; and its form may be determined by existing circumstances; provided, however, that no part be less than a *hundred yards* across.

Thus might many bleak and mountainous districts be covered with useful timber, and become a source of wealth to the proprietor, and of benefit to the nation, which at present lie waste in a great measure; perhaps affording only a sorry maintenance to a few soli-

tary sheep, and unhospitable habitations to the roe and the goat.

Success, however, depends much on the choice of the kinds of trees. This choice must be regulated, in some measure, by the quality and quantity of soil; of which see farther in the next chapter. It would be vain to expect *every* timber tree to flourish here in a superlative degree; nevertheless, there are, and those both noble, graceful, and useful trees, that will.

The native Pine, in such situations, and even where the soil is scanty, is found in the highest perfection, and of greatest durability. Indeed, in others, but for variety, it is not worth the trouble of planting: its use as a nurse, is far out-done by the Larch. This most complaisant of the ligneous tribes, which conforms to almost every soil and situation, is found even to luxuriate, beyond any other tree, on the most bleak and mountainous scites.

The Mountain-ash, or Sorb, would exuberate here, and assist in nursing the Oak, the Beech, the Elm, the Ash, the Sycamore, the Birch, the Hornbeam, &c. which may

all, in prudence, and with a reasonable hope of success, be planted. The Oak, where the soil is richest and deepest, at the bottom, or in the wavy hollows of the mountain, in greatest quantity; but a few may be interspersed every where; the Beech and Elm in all parts with freedom; and the Ash, Sycamore, and Birch, also in all parts in moderate quantities; depending most, however, on the Larch and Beech *for a crop of timber*; and on the Larch and Mountain-ash, as nurses.

SECTION II.

Low, Sheltered, INLAND Situations.

THE subject in view here, being opposed to that of the preceding section, it would appear that the difficulty of rearing timber from the want of shelter as therein stated, is at first sight obviated. If the soil is congenial, it is so in a great measure. But this consideration has led many into error, who have been tempted, by the favourable-ness of situation, to plant improper kinds, at improper distances, and of insufficient quantity, to become valuable timber. Others have erred by adhering to the opposite extreme.—A medium is adviseable.

It will be allowed, as it is presumed, that much of the future form and strength of a tree, and consequently of its usefulness, depends on its treatment in the earlier period of its existence—the first ten years of its life. Consequently, *constraint* and *restraint* are equally inadmissible. By *too thick planting*, and want of *timely thinning*, trees may be

●

constrained in growth; and by pruning, in shape. By *too thin planting*, and in masses too small, they may be *restrained* in growth, and are with difficulty pruned into shape. Trees of more than a yard in height, in the latter case, are most objectionable, being the more liable to be stunted.

Too many instances are to be found of trees, in good soil and situation, being stunted, hide-bound, crooked, and *mere bushes*, by being set at perhaps eight or ten feet apart, and planted in the eighth or tenth year of their age, which, had they been set at half the distance, and planted at half the age, would, *in half the time*, have been *thrice* the size, clean, and vigorous.

On the other hand are to be found those, which by being, in soil and situation as here defined, planted at perhaps a yard apart, and neglected in respect of *thinning*, are mere maypoles, drawn up weak and slender, and which will with difficulty bear exposure to a freer air, an article essential to their maturation as *useful* timber.

In respect of the kinds admissible here, since in point of situation *all* the timber tribe

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The Mountain-ash, or Sorb, would exuberate here, and assist in nursing the Oak, the Beech, the Elm, the Ash, the Sycamore, the Birch, the Hornbeam, &c. which may

bulwark of his native land, is an object worthy of the true patriot.

It may, perhaps, be unnecessary to inform him, that for this purpose the Oak, the Larch, the Elm, and the Beech, should be objects of his peculiar care. They are all used in ship-building, and the two first named are of greatest importance.

Mr. Marshall justly observes,* “It is a fortunate circumstance for this country, that the two trees which are most likely to furnish its navy with an internal supply of timber, should delight in soils and situations of opposite natures; and every judicious planter will endeavour to assign to each its natural station.” Meaning plainly the Oak and the Larch; for above he says, “The Oak, in shallow barren soils, and in bleak exposed situations, cannot be raised with profit, as a timber-tree; while the Larch, by outgrowing its strength, sickens in deep rich soils.”

In addition to these observations, it may be remarked, that where the Oak flourishes, the Elm will not fail; nor will the Beech

* Planting and Rural Ornament, vol. 1, p. 54.

fail where the Larch succeeds. And consequently, that there is hardly a situation or soil to be found, especially in the district under present view, whereon *some* of the kinds of ship-timber may not be reared in perfection.

That the Oak is a chief material in naval architecture is known to every one; and perhaps, also, that Elm and Beech are much used for keels. Deal is also used for sheathing and ceilings. Masts and yards are universally made of fir. Nay, many ships are entirely constructed of it. But this material is chiefly *sea-borne*, there being but little of it in the island* of size and quality fit for the purpose. Nor need we ever attempt plant-

* The famous wood of Glenmore, which gives name to a beautiful frigate, built some years since, and of which I saw a ship just launched, in May 1798, of about 800 tons, is supposed the largest and most durable timber of the kind in the island. I was informed, that every part of this large vessel was of the produce of *the Glen*. If we may judge from appearances, the durability of the timber need not be suspected—It seems to be *more* compact than foreign fir.

At *Garmouth*, on the Moray Frith, are built many large and handsome vessels of the timber of this forest.

ing it with this view, except on *exposed situations*, and thin gravelly soils.

But, for this purpose, Fir is excelled by the Larch, which, in many respects, even vies with the Oak.

“ The wood of this tree is likewise much esteemed for its exceeding great durability ; it being almost incorruptible either in the open air or under water: as is clearly demonstrated at *Venice*, the greatest part of which city is built upon *piles* of wood, which are not only still fresh, although they have remained there for many hundred years, but they have at length acquired such a degree of hardness as in some measure to resemble iron, so to resist the edge of the best tempered tool.

“ I need not point out the utility that a wood possessed of this valuable property might be of to a country like this, which depends so much upon its navy for its preservation and well-being ; as it promises to be a ready succedaneum for the Oak, and, for some particular purposes, would seem to be even more valuable than it. For although the straitness of the tree would never allow

it to be proper for ribs or knees, yet, for outward cleathing, it might perhaps be more valuable than the Oak, as it would be lighter and more buoyant, and possibly might resist the worms in warm climates: at any rate, it would not be so apt to splinter during the time of an engagement, which would save many useful lives that are always lost on these occasions by the splinters of Oak.

“Along with these properties, we ought always to remember, that, as it is of much quicker growth, we could much more easily supply ourselves with this kind of timber than with Oak. All which considerations make it merit the attention of every sincere friend to his country, at least so far as to get a fair trial made, to see whether it would answer all these valuable purposes or not*.”

Again, Mr. Marshall (*Plant. and Rur. Orn.* vol. 1, p. 143) says, “Even the Larch, it is more than probable, may be trained with great advantage as ship timber; for which it is well understood to be superiorly adapted: In Italy, we believe, it has been applied to that purpose for ages past. In the grounds

* *Observ. on Planting*, by Agricola, page 116.

of Dunkeld, a seat of the Duke of Athol, in Perthshire, there are Larches of considerable size, in a good form for ship-building. Many have a crookedness or stem adapted for ribs; and one in particular we observed with a forked top, admirably suited to knees. The former appeared to have arisen, from the stems, while young, having been in a stooping posture; and the other, from the tree having lost its head,* and two opposite side boughs having taken the office of leaders: Fortuitous incidents, which art could easily copy, and, we believe, with high advantage to this island. For, should the present price of bark continue, a supply of Oak timber, for the purpose of building large ships, will, it is to be feared, be greatly lessened, if not in some measure cut off: A circumstance, however, which will be the less regretted by the *agricultural interest*, as the Larch will flourish abundantly on lands that are, in a manner, useless to agriculture; while the Oak, to bring it to a stature suf-

* The Larch, as has been sufficiently proved, will bear the chastisement of the hedge-bill and shears with as much patience as the Quick or Beech.

fficient for the purpose of constructing ships of magnitude, requires a soil and situation which may generally be applied to the uses of husbandry.

“ Happy, therefore, is it for this island, to possess two trees, opposite in their natures, yet equally, perhaps, capable of affording protection to its political independence: and, towards securing so valuable a blessing, both of them ought to be reared and trained with unremitting solicitude.”

He farther observes of this tree, (page 178) “ A striking proof of the superiority of the Larch, in *water-works*, occurred on the estate of Athol. A weir, or river dam, which, while constructed of Oak, required to be renewed or repaired every four or five years, was formed with Larch, and, in 1792,* had stood nine or ten years; the timber then remaining in a sound, firm state.” And below he says, “ In 1792, his Grace the Duke of Athol (we speak from the highest authority) was possessed of a thousand Larch trees, then growing on his estates of Dunkeld and Blair

* On the 6th May 1798, I visited this dam; it exhibited no signs of decay at that time.

only, of no less than from two to four tons * of timber each; and had, at that time, a million of Larches, of different sizes, rising rapidly on his estate." What an incitement to the culture of these most valuable trees! the more so, when it is known, that the largest of them are, at this day, not above sixty years old.

Nevertheless, let not this operate to the total neglect of other kinds. For, from all that has been said above, it does not appear that a ship of war, or one of any considerable magnitude, can be constructed, *properly*, without a portion of Oak at least; which, from its propensity to grow crooked, where allowed sufficient room, is best of all adapted to the office of forming ribs and knees, exclusively of its superior strength. The Scotch Elm may with propriety be reared for this purpose on thin gravelly soils, where the Oak would rise slowly, and with some risk of success; as, in this case, if allowed room, its propensity is to grow crooked, resembling the Oak in form; and if not as durable, which, in this case, is even doubtful, is apt

† A ton of timber is 40 cubical feet; a load, 50.

to grow, in form, more suitable for this purpose than even the Larch. Elm timber is known to make durable *flooring* for ships; and, in *boat-building*, is much in demand for keel, stem, ribs, &c.

The Beech, for keels, is much in use, and will thrive in very opposite soils and situations: but it seems most to affect light, sandy, elevated ground. It is more than probable, however, that, for this purpose, it may be excelled by the Larch, which possesses all its properties of straightness, and closeness of texture, with the addition of *greater durability*, in any situation.

The American Spruce, in fertile hollows and sheltered bottoms, if allowed a sufficiency of room, would be useful for spars, yards, and even for masts; and may be planted in moderate quantity. But from the samples of this tree which have been produced in this island, and which have been contrasted with those of the Larch, the odds are greatly in favour of the latter. The Spruce, however, may be, and indeed is, more useful for the purpose of ceilings, than in any other way.

SECTION IV.

Maritime Situations.

FROM what has been advanced, to recapitulate the kinds and their virtues, obviously desirable for cultivation in the district under consideration, would be trifling with the time and patience of the reader. Suffice it, in respect of this, to say, that the attempt should be made, and persevered in, so far as prudence will permit, to rear all the kinds enumerated in last section; to which, however, may be added the Sycamore and Elder, as nurses, which are known to bear the sea breeze better than any other.

To sites which lie somewhat inland, though on a large scale they may properly enough be reckoned in a maritime district, much of what has been advanced in the preceding section will apply. I would be understood, by what here follows, as chiefly confining my observations to the brink of the ocean, or its larger inlets.

The situation under view is reckoned the most untoward of any on which timber may

be reared ; and many have had reason sufficient to support them in this opinion. The fact is, that, nine times out of ten, want of success has been in consequence of planting *thin*, and with *too large* plants, especially in situations much exposed.*

We are to distinguish between the banks of the Thames, the Severn, the Humber, the Forth, the Solway, the Clyde, the Murray Firth, &c. and those of the "wide ocean." On the former are many thriving plantations found, and situations *well* adapted to the culture of *young ones*, where no more than ordinary care has been, or may be, necessary in the first outset; and some of an opposite description, which I would wish to class with the bleak brinks of the open sea.

* I am aware, while I advance this assertion, that I have to combat the general idea, that sea air is obnoxious to vegetation, and particularly to the growth of trees. But, that sea air is *more* obnoxious to trees in *general*, than to grain, or the herbage which may grow under them, I deny. The fact is, it is the force of over prevailing winds, which are increased and chilled by passing over a vast expanse of water, which contributes to stunt the tree *more* than the grain or herbage ; on which they cannot act so forcibly, nor injure so much by friction or reverberation.

Where the bank is highly elevated above the level of the water, success may be more reasonably expected, than where it lies low and flat; *provided the soils bear some affinity to each other*, or that the soil of the higher ground be not materially *worse* for the purpose than that of the lower or flat ground.

I argue thus—There is what the seamen term *a lull on a lee shore*; which is observable within some three to twenty hundred yards, more or less, according to the abruptness or flatness of the bank; the current of wind passing in a direct line between some certain point of the surface of the water, and the summit of the bank. If this is the case, must not the *inferior* part of the bank be equally included in the *lull* with the margin of the water? In the other case, that is, where the land rises but little above the level of the water, the wind passes, as it were, over one continued plain; accumulating in vigour and velocity, until it is obstructed and broken by some distant mountain or high ground.

Thus shall the plantation situated on the elevated ground, except what part of it ex-

tends to the summit, be more sheltered and secure from the baneful effects of over prevailing and tempestuous winds, than that on the plain which extends to the margin of the deep.

It would now naturally occur, that to plant, in the one case, on the *face* of the bank, and considerably *within* the level of its summit, to the intent that the trees might have shelter from the current of wind till they arrived at the height of twelve or fifteen feet, and thereby screen any succeeding ones which might be planted at, or beyond it, would be agreeable to prudence; and, in the other, to plant in belts or zones (as hinted in Section I.), beginning at, or nearest to the margin of the water, planting the first one *very thick*, (perhaps at thirty inches apart) and with plants not more than from *twelve to eighteen inches in height*, being stout and well rooted.

Thus might many extensive ranges, which at present lie a reproach to the nation, be covered with useful timber, to the very verge of that element, which serves to convey from distant countries *that* which, at a fu-

ture period, *it is to be hoped*, would be forwarded from one part of our *own* to another with much celerity and saving to the kingdom, by the simple process of launching it into the flood-mark. For, although (as every Briton will hope) we shall continue to "bear the dominion of the sea," can we imagine that the forests of Norway, Sweden, Russia, and America are inexhaustible? or, that the difficulty of procuring timber from them may not increase? or, that our access to them may never be cut off?

Let us, then, endeavour to render every inch of waste land, *unculturable by the plough*, useful in the produce of an article of so much national importance; even if it should be at the expence of appropriating a part of that which is *culturable*, and which, from its local situation, may be rendered eminently serviceable to that which is not, by increasing it in volume when too small. For, it would be in vain to plant, in the situation here defined, a small corner, patch, or narrow stripe, with the expectation of ever seeing its timber rise to any considerable stature.

Nor would the arable land added thereto be lessened in value. Nay, it would be much enhanced ; inasmuch as it would operate in enhancing that of the other in a manifold degree. But many arguments might be adduced to prove, that, until there shall be *too much* timber planted in the island, the value of *all lands* lying within a mile of the sea may be enhanced more by the culture of timber than by that of any other crop.

Nevertheless, prudence forbids planting *much* of the land *naturally* and *well* adapted to the culture of " food for man and beast," until that of a contrary description shall first be covered with timber ; since the labour of carrying it from place to place weighs not in the scale with the apprehension of *scarcity* or *famine*. Further, before all the otherwise unimprovable lands in the country shall be planted, there will, with proper management afterwards, be an inexhaustible store of timber for all purposes, whether for fuel, machinery, or for ship-building.

CHAP. II.

ON THE SOILS ADAPTED TO THE DIFFERENT KINDS OF FOREST TREES.

SECTION I.

Those best adapted to the Deciduous Kinds, viz.

The Alder,	The Laburnum,
The Ash,	The Larch,
The Mountain-Ash,	The Lime,
The Beech,	The Oak,
The Birch,	The Plane-tree,
The Chesnut,	The Poplar,
The Horse Chesnut,	The Sycamore,
The Elm,	The Walnut, and
The Hornbeam,	The Willow.

BEFORE considering the soil *most properly* adapted to the trees above enumerated, it may be proper to premise,

1st. That although no tree will flourish in a *superlative degree*, except in its *own* soil, yet are they found in very considerable perfection in those of apparently different composition and texture.

2d. That there would seem to be an incomprehensible *good* or *ill* in some soils, and which is either *food* or *poison*, ultimately, to plants deposited in them*.

3d. That prudence should therefore direct putting *different* plants into the *same* soil, to the intent that each may search out that *good*, or discover that *ill*: and afterwards, the removal of the poisoned, and careful retention of the healthy and well-fed plants.

4th. As the best criterion, in a doubtful case, of the quality of soil fitted for forest timber, it might be advisable to plant many kinds, encouraging those which seem to thrive best, and which would become the most-valuable trees, by thinning away the others as they advance. For, a healthy tree, although of less intrinsic value *as timber*, is preferable to that in a languishing state, whose wood, were it healthy, might be much superior; besides, in point of gratification to the beholder, there is no comparison.

* "It is well known, that where mines of iron, lead, or copper, lie near the surface, no plant will thrive in perfection; as is the case on the Leadhills in Scotland."

5th. In favourable situations, and although the upper soil may be scanty, we are not to despair of rearing timber of *some kind* in perfection; inasmuch as the substratum is frequently found of a kindly nature, and in which the roots of trees find pasture, and take deep hold.

6th. The most untoward of all soils for the produce of timber in high perfection, is an irony till of little depth, lying on a retentive subsoil which upholds a poisonous ochry water, and which stagnates on the surface, or remains latent in the body of the soil which is the pasture of the roots,—contracting the mouths of the fibres, contaminating the juices, and finally operating to the destruction of the tree, by poisoning it, and hastening its dissolution.

In addition to these observations, before descending to consideration of the particular soils adapted to the different kinds of trees, I shall remark, that, excepting peat-bogs and other drainable marshes, which may be converted into culturable fields, and rendered highly productive of grain, by the excellent mode of draining now in practice,

the following, in most cases, are the soils and their substrata found in situations fit for the produce of timber, and in which *some* of the ligneous tribes will not fail to exuberate.

Light, sandy, or gravelly soils, on a free porous subsoil. Sandy or gravelly loams, on a porous subsoil. Sandy, gravelly, or loamy soils, on a retentive subsoil. Chalky loam, or gravelly chalk, on a porous subsoil. Loamy clay, on a porous subsoil. Clayey loam, on a porous subsoil. Strong, loamy, or clayey soils, on a retentive subsoil. Thin, heathy, moorish soils, on a gravelly or other porous subsoil. And thin, heathy, moorish soils, on a clayey or other retentive subsoil.

ALDER.

This tree, although found in highest perfection in wet spongy soils, and even in standing water, will grow freely, and flourish in sandy, gravelly, elevated lands; where, however, its tendency is to impoverish the soil, and rob all other plants of food; being satiated by a superabundance of moisture only.

The wood of this tree is of little value. It is chiefly used by the turners; to which, however, they prefer the Sycamore and Aspen-tree. I have been told by a manufacturer of gunpowder, that charcoal of it is useful in that art. It is also said to make lasting *props* in coal or iron mines. I have planted many thousands in this intention. Being planted by the sides of rapid rivers, no other tree is equally well adapted for preserving their banks.

ASH

Affects most a sandy or gravelly loam, and is there found of highest perfection and value as timber. Nevertheless, it grows freely on all soils, except a stiff clay with a hard retentive bottom. In rich lands its wood is short and brittle; but on sand or gravel it is tough and reedy, which constitutes its greatest value. In the former case, also, it goes soon to decay, by overgrowing its strength; but in the latter it will live and flourish to a great age.

No tree in the forest comes to be of use so soon as the Ash. It possesses the singular

property of perfection in infancy ! From the day its stem is three inches in diameter, the wood is equally durable until it shall be three feet, or any size or age whatever. In the character of fuel, also, it burns equally well *green* as *dried*.

The value of this timber in all sorts of husbandry work, for tools, utensils, and the coarser articles of furniture, is too well known to admit of farther comment here.

MOUNTAIN-ASH, OR SORB.

This plant grows freely in almost any soil, but is found in greatest perfection, as timber, on light, sandy, and highly elevated lands. As a timber tree, however, it is of little use, being only valued by the wheelwrights, to which they prefer Birch and Beech.

. As fuel, it is excelled by none ; to which purpose it is peculiarly adapted also on account of its quick growth, in the character of *hag-timber*. As a nurse in *bleak sites*, it stands unrivalled, except by the Larch. The bark of this tree is also found useful in tanning, and is little inferior to that of the Birch.

BEECH

Is found in greatest perfection in light, deep, chalky, or sandy loams. On all soils, except a stubborn clay lying on a retentive substratum, it becomes a graceful tree of great stature. Even among rocks, and where soil is hardly visible, this tree arrives to great magnitude, and its wood is of great durability. In all calcareous soils, it luxuriates.

The value of this tree, in naval architecture, has been sufficiently explained in Sect. III. Chap. I. to excite its culture in districts favourable for that purpose. In husbandry, and in various branches of machinery, it is very useful. It also makes durable fuel. The herring-curiers esteem it. In coaleries, it is well known to make durable waggon-ways. Beech is also much used for bed-posts, particularly those called *tent beds*.

BIRCH.

The soil which this tree most affects, and in which it is found most to luxuriate, is a lightish black loam, lying on a dry, sandy, or gravelly substratum. On moist ground,

it grows apace, soon decays, and the wood is unprofitable. On light, sandy, or gravelly soils, and in high elevated situations, it will flourish, grow slowly, and produce the most durable timber.

The usefulness of this tree in husbandry, (for harrow-buls, &c.) in machinery, and to the turner, is universally known. In coaleries, for underground *props* and waggon-road *sleepers*, it is much used. In the Highlands, where natural woods of Oak and Birch abound in mixture, and which are cut in *hags* for the sake of the bark chiefly, it is well known that the *bark* of both trees is frequently used indiscriminately; and, when otherwise, that the Birch brings a price equal to eight-tenths, at least, of that of the Oak *.

* The operation of *barking* these two trees is performed in a different manner, and also at a different season. All the bark of the Oak is used (although it is doubtful whether any but the inner bark be useful), whereas the outward shreddy bark of the Birch is rejected. The Birch is *barked* in winter, or the early part of spring; and the Oak from the first of May to the first or middle of July, according to the season. The bark of the Mountain-ash is also frequently used, and is treated in the manner of the Birch; to which, however, it is inferior. It is observable, that the bark

A vinous beverage is also extracted from this tree, which bears the name of Birch wine. Trees growing in a moist soil afford more juice for this purpose than those growing on more absorbent ones. The season in which it flows most freely, is in spring, and early in summer.

“ The Birch oil, to which the celebrated Russian leather owes its agreeable smell, is prepared from the white bark, either taken from the live tree, or collected from those that are putrid in the woods. It is best made from the latter; because by the putrefaction it is freed from the inner bark; and the external white bark remains uncorrupted for ages, as appears by the old burial places at Jenisea, and the vaults of the very ancient castle of Moscow, which I observed were covered with Birch bark. The bark is gathered into a heap, and pressed into pits made in the shape of a funnel, prepared in a clay soil; and when set on fire, it is covered with turf. The oil, distil-

of young trees, or of the branches and extremities of older ones, is most valuable, and bears the name of *Maiden-bark*. See Chap. VII. on Natural Woods.

ling through the clay-hole at the bottom of the funnel, drops into a vessel placed to receive it, and is then turned into casks made of the hollowed trunk of a tree. The pure limpid oil swims at top, and is in the greatest request for anointing leather on account of its antiseptic quality. The residuum is thick and sooty, and is employed for various common uses*."

CHESNUT (*Sweet, or Spanish*).

In respect of soil, wherever the Beech (the trees are of the same genus) *flourishes*, the Chesnut will not fail. It affects most a dry loamy soil, lying on a kindly gravel or rock. It is impatient of much wet; nor does it thrive on a stiff clay. In bleak exposures, with a poor soil, it comes far short of the Beech in point of exuberance.

This is a timber-tree of great magnitude,†

* PALLAS. *Flora Rossica*.

† At Finhaven, in Angus-shire, there still lies the remains of an enormously large tree of this species, the greatest circumference of whose trunk was 45 feet. In the possession of George Skene, Esq. of Cariston, is an engraved plate affixed to a table made of the tree, on which is marked its dimensions.

and for the sake of variety, in all extensive plantations, deserves a place. Its wood is chiefly used by the cabinet-maker; and for pipes to convey water, it is said even to equal oak. In Italy and Spain, wine casks are made of it; and it is said to possess the singular quality of neither shrinking, nor flavouring wine or other liquors. There, *as a fruit-tree*, it flourishes in high perfection; and will even do so in some parts of England. But in Scotland the attempt, with this view, has generally proved abortive. As a coppice *wood*, for hop-poles, &c. it is high in estimation. That the wood of this tree is exceedingly durable, is undubitable; the roof of Westminster Abbey being constructed of it.

HORSE-CHESNUT.

This tree will grow, and even flourish in many different soils; but it affects most a deep loam with a dry bottom. In bleak exposures, and in a thin soil, it is reared with difficulty. Nor will it bear stagnant water, or *thrive* in marshy ground.

As an ornamental tree, it is excelled by

none, for the fragrance and beauty of its flowers and foilage.—The red-flowered, and striped-leaved kinds, make a beautiful variety in ornamental plantations. As a timber-tree, it is of little note ; nor is it useful as fuel, its wood being burned with difficulty.

ELM. (*The Scotch, or rough leaved.*)

This tree suits itself to almost all soils and situations. That in which it luxuriates, is a deep black loam ; but that in which its timber is most valuable, is a lightish sandy loam, lying on a gravelly or other porous substratum. It will bear partial inundation with considerable patience, and is not unfrequently found flourishing by the banks of rivers ; which, perhaps, wash one side of its roots. On the bleakest hills, and where soil is hardly perceptible, it will find pasture, by insinuating its roots into the crevices of rocks.

As a valuable forest-tree, it stands forward in the first ranks ; giving place to the Oak and Larch only. Its timber is sufficiently well known to the cart-wright, the mill-wright, the cabinet-maker, the coach-maker,

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the pump-maker, and the ship-builder; and is by them highly valued.

HORNBEAM.

Where the Elm will grow, there will also the Hornbeam. On barren and exposed scitès, its timber is most valuable. But to the Elm, it is much inferior. To the turner, for mill-cogs, for utensils, &c. it is useful. As fuel, it lasts well, and burns very bright and clear.

THE LABURNUM

Will grow freely in all soils of an open texture. It luxuriates most in a deep, brown, sandy loam. It claims not our attention as a forest tree, except for the purposes of ornament, to which it is peculiarly adapted in the early part of Summer, when in bloom. It is said that the wood of this tree has been used in inlaying; but it is much inferior to Box or Holly. Chairs have also been made of it, and are by many thought beautiful.

LARCH.

Which soil, in this country, when in a state

of *full* maturity, this noble tree may most affect, remains yet to be known. If we may judge from appearances, we shall decide, that it will be found in the highest perfection of timber in the lighter, more gravelly soils, and in elevated situations. That it luxuriates, beyond every other tree, in all soils and situations, excepting those of a low, humid kind, is demonstrated in every instance where impartial comparison is made.

Of "its uses," and of "its virtues," much has been said in Sect. III. Chap. I. at least sufficient, as is hoped, to induce its cultivation in all districts of the kingdom, by every lover of his country and well-wisher to posterity.

THE LIME-TREE

Is found in highest perfection in low, deep, sub-humid loams. In dry, gravelly soils, it loses the beautiful gloss of its foilage, for which it is so much admired, early in Summer. I cannot speak to the properties of this tree in respect of timber; but as one of ornament, in extensive designs, it stands forward in the first ranks.

THE OAK,

“The monarch of the woods,” of which at least every Briton ought to speak with veneration, is found in many different soils and situations in high perfection. It affects most a strong, deep loam, lying on a gravelly or rocky sub-stratum. In sub-humid bottoms, where the soil is deep, it is found to luxuriate while young, but to decay sooner than where the upper soil is moist and deep, and the sub-soil of a more porous nature. In light sandy or gravelly soils of little depth, it grows slow, but firm in texture; and is in a state of maturity, though of less magnitude, sooner than on cooler, more retentive soils. Even in a tilly clay, to which most other trees have an aversion, the Oak will become useful timber.

Its uses, its properties, and its virtues, are known to all the world!

PLANE-TREE (*Platanus*).

This plant seems to affect most a deep, rich, moist loam; but will grow freely in lighter soils. We may despair of ever seeing

it rank as a timber tree, in this country, in the same degree it does as an *ornamental* one; which is by no means in the *rear*. The Oriental, Occidental, and Spanish Planes, are in high estimation, and justly too, for the decoration of the park and the lawn. They are truly beautiful trees.

POPLAR.

Of this tree there are many species; and they all generally affect the same soil, viz. a deep, humid earth. In marshes, and by the sides of rivers, they thrive apace, and arrive to great magnitude. Yet they will grow, and even luxuriate, on the lightest, dry, elevated situations.

They are all fine ornamental plants, but do not stand forward as timber trees. The Abele, however, is used by the turners, and some of the other kinds, for hoops, &c. I have even heard of small ships being built of Poplar!

SYCAMORE (*Plane-Tree*).

The timber of this tree is found of greatest durability on light, gravelly loams. Except

in standing water, it will grow, and even thrive, in almost any soil or situation. It is a beautiful tree, of great magnitude, and is more patient of furious winds than any other. It never shows a weather side, and consequently ought to take preference of all others, as a nurse-plant, in the most exposed situations. No tree, except the Elder, is equally patient of the sea breeze. Its timber is used by the turner, the mill-wright and the cabinet-maker.

THE WALNUT

Delights in a deep loam of a middling texture, and not too rich; but will thrive in many different soils, excepting hard clays, where it soon gets stunted. It also dislikes much moisture, and a wet bottom. There are many kinds of this tree, and they all nearly affect the same soil.

Every cabinet-maker knows the use and value of this wood, which for chairs, tables, bureaus, bedsteads, &c. is much in repute. As an ornamental tree, it is much admired, and for the fragrance of its foliage.

WILLOW.

In respect of soil, what has been said of the Poplar is equally applicable to the Willow. There are many kinds of this plant, which are all both ornamental and useful: the smaller growing kinds, for basket and wicker work, and the larger, for mill-cogs, dishes, hoops, &c.

But, perhaps, the most valuable of the Willow kind is the common Sallow, (*Salix caprea*;) the charcoal of which is much used in the manufacture of gunpowder; in which art, the coal of Sallow, of Alder, of red Dogwood, with a small portion of the coal of Hazel, are in demand.*

* Of this, I have been assured by a person eminent in that line; and also, that, in the vicinity of gunpowder mills, few articles of produce pay so well.

SECTION II.

*Those Soils adapted to the Evergreen or Resinous
Kinds, viz.*

The Cedar of Lebanon,	The Common, or Norway
The Scotch Fir, or	Spruce,
Pine,	The American Spruce, and
The Weymouth Pine,	The Silver Fir.

CEDAR.

THE soil, *in this kingdom*, which this majestic tree has been observed most to affect, and that in which (with perhaps one or two exceptions) it is found most to luxuriate, is a gravelly or sandy loam of considerable depth, lying on a free, porous substratum: But it will grow on all soils, and in all situations, excepting those of a *very* retentive or humid kind.

This celebrated tree is found in the highest perfection on the bleakest and most mountainous sites of the East; but whether it shall be found so on the mountains of Britain, remains to be known. It is much slower in growth, and also less docile than the Larch;

nor need we ever expect to see it become so great an acquisition to the nation.

As an ornamental plant, it ought to be admitted in all extensive designs.

Of its mighty stature ; of the durability of its timber ; of its property, in resisting worms ; of its retaining the same smell for ages ; of its admitting a high polish ; of the peculiarity of its oil, in preserving paper and cloth from corruption ; and of the value of its saw-dust, in embalming ; with a hundred more of its *properties*, famed and celebrated for ages, might volumes be filled.

SCOTCH PINE, OR FIR.

The timber of this tree is found in highest perfection on the more bleak and gravelly sites. In light sand, it is also found durable. But in the richer, more loamy soils, although it grows apace while young, and flourishes exuberantly, it soon sickens, is short-lived ; nor is the wood valuable, but short and brittle.

On retentive, tilly clays, in which it is often planted, but from which, above all others, it should be excluded, it frequently

becomes stunted, about the twentieth or thirtieth year of its age; or when the roots have exhausted the upper soil, and begin to seek pasturage in the sub-soil; insomuch, that the worms attack it *on its limbs*, anticipating, as it were, its dissolution.*

I have been told by one, to whom I would allow as much credit as any single person I have yet known, that, of a Fir-tree, the produce of one of the hills on the estate of *Appin* in Argyleshire, he made a peg of half an inch diameter; and, with a single stroke of a wooden mallet, drove it through an oaken table an inch thick, which was, perhaps, a century old.

* This has not a little arrested the attention, and excited the *wonder*, of several ingenious people of my acquaintance. Every *gardener* will admit, that, until a plant become *unhealthy*, we never discover the presence or ravages of insects. Are Onions attacked by maggots, until rendered unhealthy, or checked in growth, by parching drought? Does the coccus, &c. attack Peach-trees while they are kept clean, and in a free, growing state? Are the roots of Pine-Apples, and also their leaves, perforated or eaten by the pine bug, &c. while in a thriving condition, although these insects abound in the hot-house? Will ever a plant become sickly, if not from age, whose culture is industriously studied, and which is placed in soil and situation congenial to its nature?

How much superior in quality is this timber produced on mountains, to that produced on richer soil, and in more sheltered situations! In fine, as already said, except on sandy, rocky, or gravelly soils, this tree ought not to be planted. The many observations I have made in the Highlands confirm me in this opinion.

The value of Fir-timber (and that reared in the northern parts of the island, in soil and situation as above, is inferior to none) is known to every mechanic; nor is there any one at all acquainted with the arts, who does not know, that from this tree is extracted rosin, tar, &c.: articles which are so useful for many, *especially naval*, purposes.

THE WEYMOUTH PINE

Will grow in many different soils and situations, but seems to affect most a deep-sandy loam. On chalky, gravelly, elevated grounds, it is found to luxuriate. It will also thrive in pretty strong clay, if lying on an open substratum. It is impatient of stagnant water, nor will it flourish on a till.

This is an elegant tree, and is worthy of a

place in all extensive plantations. In America, it grows to a great height, is very straight, and fit for masts, of which are made many. Whether it will ever arrive at such magnitude in this country, remains to be known; but in low, sheltered situations, by its luxuriant growth and sprightly appearance, it seems to flatter our expectations.

COMMON, OR NORWAY SPRUCE.

Why this tree has obtained the name of Norway, rather than Swedish or Danish Spruce, is a question of little importance. But certain it is, that many have been led to mistake, on this account, supposing it to be the tree which produces the deal known by the name of *Norway Fir*, and which is the produce of the Scotch Fir beyond a doubt. The timber known by the name of *Memel Log*, is said to be the produce of the Spruce. It will, like all the Fir tribes, grow in very different soils; but is found in greatest luxuriance in deep sandy loams, where it hath freedom of space. On clays which are not retentive of water below, although moist of themselves, it will make surprising progress.

On thin soils, and in bleak situations, it grows slowly; and may therefore become the best timber of any, on such: but here it becomes unsightly.

It cannot be cultivated in this country with such advantage as the Scotch Fir, in respect of timber; but as an ornamental tree, it outdoes it, where the soil is favourable.—From this tree, pitch is also extracted in great abundance.

AMERICAN SPRUCE.

This tree seems to affect most a deep black loam of a middling texture, and which is also sub-humid of itself, but does not retain stagnant water. It will also thrive well on sandy or gravelly loams of a moist nature. On dry shallow soils, it languishes; nor will it thrive on *very* exposed sites. In deep, sub-humid vallies, are to be found those most stately in this country. It requires full space; otherwise it becomes very unsightly, even in youth.

There are two varieties, the Black and the White; which differ in no material point, except in the colour of the cones, by which

they are chiefly distinguished. Some reckon a third variety, namely, the Red, and from the same circumstance, the colour of the cone.

This tree, in America, arrives to great magnitude, and produces that vast store of masts and spars exported thence to Europe. Of this tree they also construct many ships of great burthen. But, in this country, the Larch far excels it in any situation, and, as timber, is more valuable for this and all other purposes.

It becomes a fine ornamental *detached tree* on good soil, if allowed room to *branch* in its youth, and while nursing; but at the same time it requires shelter.

THE SILVER FIR

Grows most luxuriantly in deep, loamy earth; but there its wood is soft and spongy. It will thrive on bleak exposures, and thin gravelly or sandy soil. But that in which we may expect its timber in highest perfection, is a sandy loam, lying on a gravelly sub-soil or dry rock.

On the mountains of Switzerland, it is said

to grow to a vast size,* is excellent timber, and is used for many valuable purposes. In particular, turpentine is extracted from it; and it would seem that from this tree is extracted the true Venice turpentine; although there is an inferior kind extracted from the Larch, which also passes under that name.

As an ornamental tree, it is admissible in all extensive designs; and even on a smaller scale, where variety is studied. Some, however, have thought otherwise, on account of its ragged appearance as it becomes aged; and also, that the tips of its branches frequently wither in hot weather, if it grow not on moist land. In Spring, it is observable of this tree, also, that it frequently suffers in its extremities, if severe frost happens after a series of fine weather; a thing not at all uncommon in our variable climate.

* Some majestic Silver Firs at Duplin, the seat of Lord Kinnoul, are supposed the largest in the kingdom. I must acknowledge I have not seen their equals.

CHAP. III.

ON NURSING SEEDLINGS FOR EXTENSIVE DESIGNS.*

SECTION I.

Situation and Soil of the Nursery.

SO much hath been said concerning the question, Whether a nursery should be on soil, and in situation corresponding with those on which the trees are ultimately to be

* I say for *extensive* designs, because experience hath taught me, that *otherwise* it is *no saving* for any gentleman to rear nursery. I confine myself to the nursing of *seedlings only*, on the same principle; and from indisputable proofs, demonstrated both by myself and my father (who had, perhaps, as much experience in that line as most men of his time), and several of my intimate friends, who have made impartial trials for ascertaining *how far* it might be to a gentleman's advantage to rear his own nursery from seed.

We have all found it unprofitable, and attended with considerable perplexity. A thing not at all to be wondered at, when we reflect on the multiplicity of business at *that* season most critical, not only for insuring success in this branch, but all others of gardening, namely, the spring.

planted? that I should deem it unpardonable to pass this subject in silence. I will briefly deliver my *own* opinion, hoping the candid reader will apply or reject what agrees with, or stands opposed to *his*.

If the soil and situation whereon the trees are ultimately to be planted be *good*, or shall nearly resemble what is described below; then, if all other circumstances concur, I conceive the trees ought to be nursed on the spot; but for no other reason than that it is

Let him who has had the management of an extensive forcing, fruit, kitchen, and pleasure garden, and also of extensive plantations and other out-works at the same time, say, whether he could not gladly dispense with the charge of sowing nursery seeds, &c. and whether, if it was not in his power, from the pressure of other business, to sow them with his own hand, he would be at all anxious for the security of a crop, and consequently, the interest of his employer.

But I am persuaded, that unless a *gentleman* shall keep a proper bred nursery-man, be his designs what they may, he will never rear nursery from seed, so cheap or so good as may be purchased. In no business whatever do men in general excel in *all branches*; and of gardening this is a very important *one*. Moreover, there is now considerable emulation in the nursery line; *which*, in *every* business tends to public advantage. If a man purchase *bad* trees, the fault rests with himself, so long as by looking around him he can find *better*.

less expensive to carry to a distance seedling, than transplanted trees.

But, if the soil whereon the trees are to be planted be *bad*, or essentially different from that I am about to describe, and if the situation be bleak, and exposed to violent winds, then I should conceive the attempt to rear nursery, clean, healthy, and well-rooted, opposed to common sense.

Are not care and attention necessary in rearing all *infants*, whether animal or vegetable? Are not some animals more tender, and, while in *infancy*, reared with more difficulty, than others? Do not some animals, which with difficulty are reared in infancy, afterwards become robust, and capable of enduring the greatest hardships?

The comparison holds with respect to plants. Are the Ash, the Beech, the Birch, the Elm, the Larch, and the Oak, reared in *infancy* with equal ease? Do they not, if properly treated, all equally flourish afterwards on the mountain, in the vale, where soil is hardly found, and where it is found in abundance? Do we sow seed in sand, gravel, clay, the crevice of a rock, on the

bleak top of a mountain, or in a fertile vale, with *equal* expectation of seeing it rise a goodly plant? Shall we plant a *mere infant* with like expectation? Or, shall we rather expect, that by sowing or planting in a medium soil and situation, there is greater probability of success? Inasmuch as I consider the chief property of a young plant intended for after-removal, to depend on strength and cleanness of root, and a multiplicity of healthy fibrils, I answer without hesitation, yes; and therefore define the most proper soil and situation of a nursery for the purpose in view,* thus:

A loam of a middling texture, rather inclining to sand, neither rich nor poor; from eighteen to twenty-four inches in depth; lying on a free, porous sub-stratum. This will be found *more generally* congenial to the nature of the different forest trees than any other soil. But there is no general rule without exception. If there be a diversity of

*The reader is requested to observe, that I neither treat of sowing seeds, nor propagating by layers, cuttings, &c. for reasons above mentioned. I only wish to treat of nursing seedling plants, until fit for final transplantation.

soils, and if they do not *too* nearly approach the extremes of *meagre sterility* and *excessive fertility*, so much the better; since all the kinds do not *exactly* thrive alike in the same soil; and an opportunity would thereby be afforded of placing *each* in *that* more congenial to its nature. (See Chap. II.)

The site should neither be high nor low, sheltered nor exposed, in any extreme, for the same reason, viz. that it may the more generally answer *all* purposes. For, who do we expect shall set out on the *Quixotic* idea of making a separate nursery for *each* kind? or who shall resolve on planting one kind *only*?

I conceive, and indeed have proceeded on the principle, that for a nursery of this description, nothing can be more eligible than the spot which may also occasionally be occupied as a kitchen garden. That is to say, if three acres of nursery be required for accomplishing the design in question; and if out-field kitchen ground* be also required

* The eminent utility of raising common kitchen vegetables in exposed ground rather than in the more sheltered, is pretty generally acknowledged. For a full ex-

for the service of a large family; inclose for this purpose, suppose four or five acres, with a sufficient quick-fence, or low wall. And hereby will be accomplished two grand points, viz. *well-broke* land of a good quality and tilth, and the opportunity of an effectual rotation of crops at pleasure.

But if no extra kitchen ground be required, it will still be adviseable to inclose a considerable quantity more than might be wanted for the purpose of nursery; which could be employed with advantage in the culture of carrots, turnips, potatoes, clover, &c. for cattle feeding, and would equally operate to the benefit of the trees, by the rotation of crops and pulverizing of the soil.

In all cases, it will be adviseable to trench the ground to its full depth, in preparing it for nursery; and, if necessary, to give it a dressing with lime, marle, dung, &c. *in compost*. Other manure should never be applied to nursery ground at the time of cropping with timber trees. At the time of cropping

planation of my ideas on this subject, I beg to refer the reader to the Forcing, Fruit, and Kitchen Gardener, Book II. Chap. I.

with esculents, manure, either simple or in compost, may be applied ; as conveniency and the nature of the crop in question shall determine. But, that the trees should immediately follow a *manured* culinary crop, is the best of all methods ; as, in that case, no manure would be required for the timber crop.

I have known an instance, where a field was *taken in* for a nursery, from an old pasture of a rough sward, and in which myriads of the grub-worm, slug, &c. had found an asylum. It was conceived, that by sub-trenching, or deeply digging it, the land might be effectually cleaned ; and accordingly, the field was planted with nursery, without any preparatory crop of grain, &c. being taken. But the result was, that most of the Firs, the Larches, the Elms, the Beeches, &c. became a prey to the vermin, the ensuing season ; and their stems were found peeled entirely round, about an inch under the surface.

For this reason it becomes a matter of caution, that a like misfortune be avoided, to take a crop, or crops, of grain, potatoes,

turnips, &c. in order to thoroughly cleanse the soil of these noxious vermin, before venturing in it the more valuable crop of nursery.

In respect of the proper rotation, much must be left to the judgment of the operator, and existing circumstances. The following example is given on the supposition that it may be applied, or partly rejected, according to the exigency of the case:

1st. Vegetables, with manure;—winter fallow.

2d. Evergreen and resinous trees, without manure.

3d. Sub-trenched;—deciduous trees, ditto, ditto.

4th. Potatoes or turnip, with manure.

5th. Evergreen and resinous trees, as before. And so forth.

SECTION II.

Culture.

As, according to the SYSTEM here set forth, we do not *nurse* trees in general more than two seasons; as they are either one or two years in the seminary, according to their kinds, before they come under view; and, as the after-treatment for many kinds is the same, it would only occasion unnecessary repetitions to particularize the treatment of each individual. For the sake of brevity, therefore, I shall class such as with propriety may be classed together, and whose culture in the nursery is similar; particularizing those *only* that are of the greatest importance, and whose treatment is materially different.

ALDER AND BIRCH

Should remain two* years in the seminary, and will then be fit for removal into nursery

* They are often, however, planted out at one year old, particularly if the plants are stout and healthy.

rows. The richest and moistest ground in the nursery, provided it be of soil, and in situation as is described in last Section, should be allotted for them. They are to be planted in lines twelve inches asunder, and about four inches in line. The roots of the Alders may be trimmed a little with the knife. The Birches must not be touched.

Whether plants should be put in with the *spade* or *setting stick*, is a question frequently agitated. I am of opinion it is a matter of little importance to plants of this age, *which* method is practised, provided either be well performed. The size of the roots should determine.

It would certainly be improper to force a large root into a small hole, to the evident detriment of the plant, by its roots and fibres being bundled together in a mass, without the intervention of mold. It is equally improper to force a plant into a *slit* or *gash*, whose sides, by the operation of making it, are hardened and rendered impenetrable, in a great measure, by the tender fibrils for a time, until rain, and the influence of the weather, soften them.

Therefore, for the better performance of both methods, I would advise, 1st. *For dibbling*: That the ground be *well broke* in the operation of digging or trenching; that whatever is dug, be also planted the same day; that it neither be dug nor planted in too wet or too dry a state; that the hole be made large and loose by a twitch of the hand; that the plant be just sufficiently fastened to keep it in proper position; and, that at the end of each day's work, the whole be levelled, and the earth closed to the stems of the plants with a short-headed rake.

2d. *For laying in with the spade*: That (instead of digging over the ground first, and then planting in a *slit* or *gash*, whereby the sides of the *slit* are hardened, and the roots crowded in), the digging and planting be both carried on together; that is, turn one furrow farther than where the row is to be placed; cut perpendicularly by the line; place the plants; turn another furrow to their roots; turn a second, or, if necessary, a third furrow; cut and place as before, &c. Tread none. Smooth all with the rake.

ASH, AND MOUNTAIN SORB,

Should also remain two years in the seminary. The poorest soil in the nursery should be their portion, reserving better for the kinds to follow.

Plant also in lines twelve inches asunder, and four in line. The roots of both may be moderately trimmed with the knife.

BEECH, AND OAK.

These are also to remain two years in the seminary. Plant in good soil, in lines fifteen inches apart, and five or six in line. Their roots must, on no account, be pruned at this time; otherwise not one half of the plants will *strike*.

Here they are to remain for two seasons. At the end of the first, let their tap roots be cut at the depth of six inches below the surface, a person rutting on each side the row, with a spade sharpened on purpose, so as to effectually cut the tap root of each plant, with as little injury to the upper part as possible. Point up the intervals of the rows, and level all to the stems of the plants.

At the end of the second season, the plants will have made fibrey roots, and be fit for removal to almost any situation. But, if for any particular purpose it be necessary to nurse them longer, in that case they should be transplanted next season, into fresh nursery-rows; allowing them a little more room, and shortening all roots which have a tendency downwards.

CHESNUT, AND HORSE CHESNUT,

Should also stand two years in the seminary. Any part of the nursery will suit them. Plant in lines fifteen inches apart, and four or five in line. Their roots may be gently pruned. Here they are to stand two or three seasons, according to their progress.

Being chiefly ornamental plants, and designed for the less untoward situations, they are frequently required of larger size. If so, move them at the end of the second season; replant them into rows eighteen or twenty inches apart, and eight or nine inches in line; previously shortening all roots which tend downwards, and *tapping*, as advised above, for Beech and Oaks.

ELM, HORNBEAM, AND SYCAMORE.

These are sometimes removed from the seminary at one, and sometimes at two years old. I prefer the latter. Plant in lines at twelve inches apart. The roots may be gently pruned, if needful.

At the end of the second season, they will be fit for removal to any situation, where soil to the depth of four inches is found; but if intended for more barren sites, remove them at the end of the first year.

LARCH.

Perhaps I stand single in saying, that the Larch should never remain more than one season in the seminary. I am convinced of this, from having made a variety of experiments for ascertaining the quickest and most advantageous methods of rearing this useful tree.

Perhaps I also stand single when I assert, that the result of these experiments has proved to my entire satisfaction, that a healthy seedling of one year, also nursed one year, in moderately good soil, having a

sufficiency of room, and being kept properly clean of weeds, will, in any soil or situation wherein it may afterwards be placed, out-grow another of *any age* within the seventh year after transplanting.

I have planted *many* of this description, and, within that period, have measured them fifteen feet in height; while those on the same spot, planted the same day, and which were, some two, some three years nursed, did not measure above twelve feet, nor were so straight or beautiful.

In fine, I have found the progress of this plant, in infancy, follow in this rotation on all soils where I have made the experiment; and these have been very different in quality and depth:—

- | | | |
|---|--------------------|--|
| 1 | One-year seedling, | One year nursed. |
| 2 | Ditto | ditto, { Ditto, removed, and nursed a second year. |
| 3 | Ditto | ditto, { Nursed in the same row two years. |
| 4 | Two-year seedling, | One year nursed. |
| 5 | Ditto | ditto, { Ditto, removed, and nursed a second season. |
| 6 | Ditto | ditto, { Nursed in the same row two years, |
| 7 | Ditto | ditto, Ditto for three years. |

If this is the case, may we not also suppose, that, since the first outgrows the others in infancy, and on good soil, it will continue to surpass them on bad and shallow soils; as by reason of its small size, it could be more effectually planted? Whether of the two would be most apt to suffer by inclement weather, and, consequently, soonest get stunted?

Wherefore, let the plants be taken from the seminary at one year old, and nursed one year, in rows twelve inches apart, and four in the row. If plants of a greater size be wanted, remove them at the end of one, and nurse them another year, in lines fifteen inches apart, and six in line. Beyond this the Larch should never be nursed.

The infant tap roots may be shortened a little: but after this, prune none.

SCOTCH FIR, AND WEYMOUTH PINE.

Unless for the purposes of decoration, or where it is wanted for variety, the former, viz. the Scotch Fir, is never nursed, but taken from the seminary at two years old, and then planted out for good. I approve of

this practice, provided the plants stand *thin* in the seminary; but otherwise, they should be nursed one year in lines a foot asunder, and an inch in line. If they are required of a larger size, remove them from this into other nursery lines, at twelve or fifteen inches apart, and four or five in line, according to the time they are to remain here, which, however, should not be longer than two years for any purpose whatever.

The Weymouth Pine should also stand two years in the seminary, and then be nursed two or three years in rows; according to the purpose intended, or the quality and depth of soil wherein it is afterwards to be planted. In either case, fifteen inches between the lines will be sufficient; and if they are to remain two years, four in line; but if three, five or six inches in line.

The tap roots of the seedlings of either may be shortened a little; but at the second, or any subsequent removal, their roots must not be touched,

COMMON, OR NORWAY SPRUCE,

Should be removed from the seminary at

two years old, and nursed in lines twelve inches apart, and three in line, for two seasons. At the end of which, remove them into other lines fifteen inches apart, and four or five in line; there to remain one, or at most two years, as shall be determined by their progress, or the soil they are to be planted in. If they are intended for *very* barren sites, plants nursed for two seasons *only* are to be preferred.

The roots of this plant should not be pruned at any time, if it can be avoided; nor, indeed, should any of the resinous tribes, except a small bit of the tap roots of seedling infants.

AMERICAN SPRUCE, AND SILVER FIR.

These are also to be taken from the seminary at the end of the second year, and planted in lines twelve inches apart, and four in line. Nurse them here for two seasons, and then remove them into other lines, eighteen inches apart, and six in line; there to remain for one or two seasons more, according to circumstances. Longer they should not be nursed. If they are intended for bleak

exposures and barren soil, they should be removed thereto at the end of the two first seasons of nursing.

QUICK, OR WHITE THORN.

This most useful plant may remain either one or two seasons in the seminary, according to the progress it may have made. Plant in lines twelve inches apart, and two in line. At the end of one season, remove the plants into other lines twelve inches apart, and four in line. Their roots may be gently pruned.

The cause of removing them at the end of the first year, is to encourage the progress of their fibrey roots. At the end of the second, they will be fit for *hedging* in any situation whatever; nor will plants of any age or size outgrow them within the third year, if they are properly kept clean afterwards. This I have proved by repeated experiments, made impartially on very different soils and situations. But of this, see Chap. X. Sect. I.

Hitherto I have taken no notice of the time of planting. For the deciduous kinds, I esteem from the middle of February to

about the twentieth of March, the most eligible season. For the Evergreens, from the twentieth of July to about the middle of August; taking advantage of wet or cloudy weather, and frequently watering in hot, dry weather till the plants have struck root.

It is certain, that all plants are most successfully removed at the time they are just beginning to vegetate; but in extensive operations it is impossible, or at least would be imprudent, to defer planting in order to hit the very *nick of time*. Evergreens, in general, take a second growth about the end of July or first of August, and are then more successfully transplanted than in the spring. The best period *of the spring* for moving Evergreens, is the middle or end of April, just before they begin to grow.

Let the plants, of all descriptions, be carefully kept clean of weeds in the Summer months; and let the interstices of all rows, which stand over year, be *pointed* with a narrow spade, in any of the winter months, being careful not to injure the roots of the plants in the operation.

In respect of pruning, the *Evergreens* are

not to be touched, unless they shall put forth *rival* stems or leaders; in which case, the weakest must be displaced. The Larch is to be treated in the same manner. All *branches* of the *deciduous* kinds, which seem to rival the *stem* in size, or take upon them the office of leaders, are to be cut clean off by the bole with a sharp knife. Others should not in prudence be touched. The plant is not to be pruned to a *mere switch*. Let us remember, we are but the assistants and humble improvers, not the controllers of nature; and that, if, by our over officious interference, the plant shall be hurt *in infancy*, even time itself will hardly repair the injury.

CHAP. IV.

ON PLANTING, AND THE MANAGEMENT OF NEW
PLANTATIONS.

SECTION I.

On Preparing the Ground, Pitting, &c.

THE preparation of the ground for the reception of the infant plants, is an object of the utmost consequence to their future welfare; and whatever method is practised, it should be *well* performed. That I may have it in my power to speak with precision, I shall faithfully state my own practice; and that the subject may be more clearly understood, and less complicated by repetitions, let us divide it into the following heads; viz.

1st. Clearing the ground of whins, broom, bramble, &c.

2d. Draining.

3d. Ploughing, &c. only.

4th. Pitting only.

5th. Ploughing and Pitting.

1st. CLEARING THE GROUND—of whins, broom, bramble, briar, brushwood, &c. &c. if they abound on or encumber * the site to be planted, to the most superficial observer must appear necessary ; to the welfare of the trees it is indispensably so. Therefore, let the *brush* be cut † an inch or two within the surface ; and so soon as sufficiently dried, let it be collected into heaps and burnt.

The ashes are a strong manure ; and if the ground is to be ploughed, they should be carefully spread and ploughed in, if of

* In cases where the plough cannot be introduced in the preparation of the ground, and where the whins and broom are so thinly interspersed on the surface as not to obstruct the operation of pitting ; and particularly if the situation is bleak, it may be prudent to leave the plants of whins, &c. which are placed in the intervals of the pits : in which case, they would act the part of nurses to the young timber crop for a time. See Sect. VII. of this Chapter.

† For this purpose, I have been in the habit of using what we termed the *whin-axe* : an instrument having one end, like a common axe, with four inches of face ; and the other like an adze, also with four inches of face ; whereby the person using it, continuing in the same position, by simply turning it in the hand, can make cuts at right angles with one another, as circumstances may require. The head of the tool may be about eight inches in length, weighing from two to three pounds ; and the handle of ash, about four feet long.

quantity sufficient, over the whole field, otherwise on the wet or colder spots. But if the ground is such that it will not admit of ploughing, let the ashes be mixed up with part of the best surface mould, to keep them from blowing abroad ; and in the process of *putting*, let a little of this compost be intimately mixed with the mould of each pit ; previously distributing it in small heaps at convenient distances, for facilitating the operation : and this extra trouble will be amply repaid by the progress the plants will make in consequence.

Accident, which discovers many valuable secrets, first led me to the knowledge of this ; and I am so fully convinced of its efficacy, that I would seriously recommend the practice in all cases where opportunity affords the means.

Having cut the *whins*, which were the most luxuriant crop of the kind I had ever seen, of a field which was planted with timber-trees the following season, they were gathered into *wind-rows* and burnt. The ashes were not spread, but negligently suffered to remain as they lay, the wind, per-

haps, shedding a considerable quantity of them over the adjacent spaces, but leaving the greater part in rows. The ground was not ploughed, but pitted, because the former operation was impracticable, by reason of the strength of the whin roots. Nor were these, on account of the expence, stubbed up.

The effect of the ashes was such, that on the *wind-rows* an astonishingly luxuriant herbage rose the following season ; inso-much, that the trees were completely covered in summer, and borne down by the weight of the herbage in winter, till relieved by the hand. The next season the herbage was somewhat less luxuriant ; but even the third season it was more so on the *wind-rows* than it was the first season on the interstices.

Until the third season the effect of the manure on the trees was not perceptible. But from this time, for three or four successive years, the difference of growth on the trees of the *wind-rows* and intervals was very obvious, and greatly in favour of the former.

I can in no other manner account for this difference not being perceptible sooner than the third season, than, that in the *second* there arose a very strong crop of whins from the old roots, which may have retarded the progress of the trees, but which were completely destroyed the following winter, by chopping, with sharp spades, all whins, brambles, &c. which anywise disturbed or approached the trees, or original pits.

In some situations, perhaps, such *brush* might bring a good price for fuel. If disposing of it would really serve the country, who would refuse it? But otherwise, if its price would not purchase lime or any other manure equal in value to the ashes, and which (if necessary) being applied in manner as advised above, might act to the benefit of the timber, in a case like the preceding, or to the preparatory crop of grain, turnip, &c. it certainly would be less expensive, and equally advantageous, to burn it on the ground, and apply the ashes as a manure.

It may happen, inasmuch as soils which we often find covered with heavy crops of

whins are frequently excellent, that the application of this, or any other manure to a *timber crop*, would be imprudent, while it might be rather in demand for the farm or garden. In this case, the ashes are worthy of removal to a great distance, and would much enhance the value of any compost preparation.

By reason of the great expence incurred by grubbing up the strong roots of all whins, broom, &c. which the plough cannot displace, I believe it is seldom practised; although every one will admit its utility.

I confess that I have never practised it myself, having generally been employed on too large a scale of planting for putting the practice in execution at a moderate expence. But to remedy this, in a great measure, I have been in the practice of going over the ground every second year, with sharp spades, chopping all brush, &c. and relieving the trees; of which see more in Sect VII. of this Chapter.

2dly. DRAINING. It is now pretty generally understood, and the argument is supported by the most unequivocal proofs,

that draining is not more necessary in the garden, or on the most improved, ornamented, and highly cultivated farm, than in the forest.

The bad effect of stagnant water, no doubt, is sooner perceptible on culinary vegetables than on trees; but to the latter, it is equally, if not more, pernicious. To the owner, it is most galling; to the disinterested beholder, a matter of sincere regret—to see thousands of trees, which have cost much money, labour, and anxiety, instead of being an acquisition to the proprietor and the nation at large, going fast to decay, stunted in infancy, drooping, and poisoned by the stagnation of that otherwise most necessary element, and which, at a small expence, perhaps, might have been diverted into another channel.

Let us profit by the example; and before planting, render the soil comfortable, by judiciously draining it of all stagnant, superabundant, and noxious moisture, whether in its body, or on the surface.

To point out methods would be an endless task, and futile in many instances; since

the means must ever vary with circumstances, and these will be multiplied by many unforeseen causes, according to locality and situation.

Perhaps open cuts, if effectual, are the best of all for forest draining; nor can they be inconvenient, as in farming, since the plough is not employed here after the trees are planted.

Covered drains are expensive, and they are also liable to injury by the strong roots of trees. Or, if a tree shall happen to stand upon the drain, its weight, in process of time, may crush it down, and ruin it entirely.

Drains filled with small stones, brushwood, &c. are inadmissible, for they can be no longer effectual than till the roots of the trees begin to run through them, and consequently, render them useless.

But, now that the use and effect of the auger is demonstrated by Mr. Johnstone's excellent book on this subject, in most cases, perhaps it may be both the cheapest and most effectual method of draining by aid of open cuts; which, however, would require to be always kept well *scaured*, and the au-

gur-holes frequently probed, by reason of the leaves of trees falling into them.

Whatever mode is practised, it is essentially necessary for the welfare of the plantation, that it be *well* performed ; and that the drains, of whatever description they be, be always kept in proper repair ; the good effects of which will be visible on the timber, whether while growing, or when felled. Nor will the purchaser, who buys the timber on its *foot*, complain that the most valuable part of his tree, the root-cut, is spoiled by the rot, induced upwards by spouty soil.

3dly. PLOUGHING ONLY. This mode of preparation, on tillable sites, and where the soil is thin, is the cheapest and most effectual method. If the land has been in tillage, it wants nothing more than two furrows, and as many strokes of the harrow, to render it fit for the reception of trees. But if it is in ley, a crop of oats, &c. the season before planting being taken ; or if it is stubborn, a second crop, perhaps of beans, turnips, or potatoes, will be necessary ; previously ploughing and harrowing well, and laying the land up in a comfortable manner.

It is indispensably necessary, in following this mode of preparation, to plough the land to its full depth each time. In this intention, where the soil is deeper than the plough can reach at *one* furrow, it is a good method to make another plough follow in the *same* furrow.

4thly. PITTING ONLY. This is an important article, on which I wish to be particular, because the judicious performance thereof is of the utmost consequence to the establishment of the young plants.

Other than on untillable sites, *pitting only* is not advisable. I am therefore to be understood as treating of unculturable steeps, coal or lime *drifts*, stoney, or rocky places, &c. where the plough cannot be introduced : places most frequently appropriated to the culture of timber.

And first, I wish to observe, that I pointedly disapprove of *pitting and planting at the same time* : a practice very common. Secondly, that I also disapprove of the common method of *digging out the mould*, and laying it for a time, until the season of planting, *around the pit on the surface*. Because,

By the first mode the mould undergoes not the process of fallow ; nor, by the second, is the turf rotted, or in anywise meliorated ; but on the contrary, dried for the most part *like a peat for the fire*, or what vegetable matter it once contained, and which would have acted as a manure for the infant plant, by a proper treatment, is either blown away by the wind, or washed off by blanching rains.

Instead of these methods, my practice has been, provided I had timely notice of my employer's intention of planting such and such a field, &c. to begin pitting in May, what I intended planting the following November ; in June, what was to be planted in December ; and in July and August, what was to be planted in January and February ; generally allowing the land to be planted, six months fallow : *Filling one pit out of another*, chopping the turf small, and laying it in the bottom ; whereby it was perfectly dissolved at the planting season, and rendered into mould fit for the reception and immediate nutriment of the tender plant.

In *thin* soils this mode is eminently useful, the turf, for the most part, constituting, or at least containing what is valuable therein. And since it is frequently necessary, before the tree can be kept in position, to go deeper than the turf or upper soil will admit of; by burying the turf in the bottom, and covering *it* even with what might be noxious to the *plant*, a fit mould is prepared for its reception against the planting season.

Wherefore, if we admit that *fallowing and aerating* land is of advantage, and that the above process is a species thereof, so far as the case will admit, reason at least would seem to approve of the practice. The event hath justified it. I have ~~always~~ found, all other circumstances concurring, the trees whose *pits* were made before midsummer, surpass those whose *pits* were made after that time.

Whence, I made it a rule to *pit* land of a *rough sward* sooner in the season than that of a more *smooth* texture, that the vegetables on its surface might have the more time to dissolve into nutritive matter for the im-

mediate sustenance and nourishment of the infant plant.

I would remark here, that it is very improper to pit clayey soils, which, in that case, would hold the water like a dish, in heavy rains, evidently to the injury of the plants.

In respect to the size of the *pits*, circumstances must ever determine. The depth of soil, and size of the trees to be planted, are subjects of the first consideration. In respect of the former, I follow the invariable rule of *pitting* always to *its full depth*, be it ever so much ; and when there is only a thin stratum of turf, &c. of going *a few inches deeper*, simply for the purpose of having the turf *buried* and effectually *rotted* before the planting season. For otherwise, I hold it to be particularly injurious to place the young and tender fibres in cankering gravel, in till, or corroding sand.

In respect of the latter, namely, the size of the trees, which may be considered to regulate the diameter of the pits, by the SYSTEM here set forth, and for the situation under present view, trees of more than

eighteen inches in height are not planted, and whose fibres do not occupy a space of more than nine inches diameter, when fully spread; I consider fifteen inches a good medium diameter for the *pits*; whereby there will be at least three inches of broken mould beyond the fibres on all sides.

This, perhaps, is as great a *stretch of preparation* as the money bestowed for this purpose *generally* will afford; but who will deny, that it were better to trench *the whole ground* over? Yet, since it is more advisable that six acres be planted, of land of this description, than one; and since, if plants of this description be also planted, nature will not fail to do her part, let us be contented herewith, in this stage of the business; and follow up our duty in that of culture, pruning, thinning, &c. with unremitting attention.

5thly. PLOUGHING AND PITTING. Here I beg to be understood as speaking of tillable land, and which is also deeper than even the *trenching plough* can reach. For otherwise, this matter is comprehended under the third head of this Section.

For reasons just mentioned; viz. that it is advisable to *pit* to the *full depth* of the soil, and that it were better to trench *the whole ground* over, this mode of preparation is introduced; although it must be allowed not to be completely effectual, since the plough reaches not the bottom, and that part between the *pits* remains untouched.

Yet this defect is more than counterbalanced by the improvement of the upper soil; nor is the process of ploughing expensive or tedious. Weeds, &c. are also hereby effectually destroyed, and the soil rendered more pervious to the action of the elements.

Moreover, when vegetables are intended to be cultivated among the trees, a practice extremely proper *for a time*, when it can be done with advantage, the process of ploughing for the first crop at least, becomes necessary.

In this case; viz of *ploughing and pitting*, it matters not much at what time the *pitting* be performed; provided it be done a few weeks before planting, that the bottom soil may be exposed to the weather, and

thereby be meliorated and divested of **any** crude particles it may contain. The **upper** soil is to be carefully turned down to the bottom, provided it be the best of the two, (for instances are not wanting of a better *under* than *upper* stratum, where the soil is pretty deep,) that it may more effectually act to the advantage of the plant, in the early period of its *change of situation*, a most important one for its future welfare.

The *size* of the *pit* is here also to be regulated by that of the tree, paying particular attention to the bottom part, or that which lies under the reach of the plough. Indeed, in all cases, the pit should be made rather widest at the bottom, which is the safer side to err on.

And here I cannot help observing, that where *least* trouble of making the pit is requisite there it is frequently *worst* performed: because, from the loose texture of the upper soil, in the case of the ground having been previously ploughed, the margins of the pits stand not as first marked out, but crumble down, and the workman imagines he hath made a larger pit than he was instructed to

make ; nor is he at proper pains to enlarge the bottom.

Hitherto I have taken no notice of the distance between the pits, nor does that article properly come under view here, as in Section III. the distance between the trees will be particularised, which consequently must regulate that of the pits. But I would observe, that they are not to be placed in lines, but in the quincunx manner, unless it be intended to cultivate rows of cabbage, potatoes, &c. among the trees ; in which case, their being placed in line would be more convenient for that purpose, though not more advantageous to the timber crop. Of this see more in Section III. of this Chapter.

From what has been said above, respecting the various modes of *preparation*, I must beg the reader will keep in view, that the *least expensive*, but at the same time *most effectual* method is to be advised. Where the plough can be completely effectual, use the plough alone. Where it cannot be introduced, use the spade and mattock. Where all are useful, use all ; nor be sparing of ne-

ecessary labour, which, by the progress of the plants, will be amply repaid.

Indeed, as I have already said, it were better to trench the ground in all cases. But in extensive designs the undertaking is vast and expensive. And since, I again repeat it, it were to be wished for the good of posterity, that six acres rather than one were planted, of land fit for no other purpose, or which in no other way could be so advantageously employed; let it suffice, that by properly following the above *modes of preparation*, we commit the plants to the soil, and bestow part of the expence and labour which might be required in trenching or digging, on their future culture.

And in this we shall excel many, who bestow much money and labour on *planting*, without giving themselves any concern about the future welfare of the plants, which, instead of cherishing, they abandon to their fate; not even, perhaps, defending them from the ravages of cattle.

SECTION II.

On the proper Age and Size of the different Kinds to be Planted, according to Situation and Soil.

THE planter's attention is particularly requested here, as much of the future success depends on the subject of this Section.

Perhaps some may think I say too much, when I assert, generally, that trees three, or at most four years from the seed, and which are from twelve to twenty-four inches high, will, in any situation or soil, outgrow those of *any* size under eight or ten feet, within the seventh year. Observe, I say generally; for, by planting a Poplar or Lime of eight feet, in deep mould and as sheltered situation, they will most likely outgrow an Oak or Elm of twelve inches *within* that time. But change situation and circumstances; place them on thin soil, and in an exposed situation, then mark the result. The young plants flourish; the others languish.

This may be deemed an unfair comparison, the trees being different in their na-

tures. But let the trial be made in *any* situation with plants of the same species or kind: take two Oaks, two Beeches, two Larches, &c.; one of each being, suppose eighteen inches, and the other any size from two to ten feet in height; and I do assert, that, by an impartial treatment, the young will outgrow the old plants within the seventh year. Nor will the latter ever overtake them in growth, become such handsome trees, or valuable timber.

If this is the case, and every impartial observer will admit it, may not much money be saved by adopting this mode, which is lavished on nursing, or the purchase of trees which *no art* can fully reconcile to their transposition, or future care train up, so as to become so soon, if ever, as handsome, healthful, or valuable plants.

Many, who are too desirous of *immediate figure*, are deceived in the anxious gratification of their wishes in this respect. How often do they, to their infinite regret, witness the trees they fondled and removed at much expence last year, and which brightened their hopes by showing leaf, and even shoot-

ing forth this season, becoming stunted, hide-bound, languishing, and finally perishing the next! How different the pleasure of beholding a healthy, cheerful, vigorous, young plant, "doubling its stature each year?"

Nevertheless, for this purpose, *immediate figure*, where the soil is *good*, and the situation *sheltered*, there is a medium which may be deemed *happy*.

Deciduous trees of all kinds, except the Larch, of from three to five feet in height, being carefully raised with good roots, will generally succeed. I have already shown, that a one year seedling Larch, nursed one, or at most two years, will outdo all others of its kind in any soil or situation, and therefore advise planting of this age only. Firs of any kind will succeed *better*, if under than above thirty inches; even in the most favourable soil and situation. Most generally, those of fifteen or eighteen inches in height are to be preferred.

From this view of the subject, it may occur to some, that to plant seedlings *only* would be the most advisable and least ex-

pensive method. That it would be the least expensive method, is obvious; but that it is most advisable, except for the Scotch and Spruce Firs, may be disputed.

The chief property of any young tree, intended for transplantation, consists in a multiplicity of healthy fibres. Hence the necessity of nursing, in *kindly-soil*, for a year or two, all *tap-rooted* plants, for attainment of this object, and that we may commit them to the less genial soil, and more untoward situation with greater probability of success. For, whether shall we suppose the plant which has both root and branch to make, or that which has the latter only in the first season after so important a change of habit, is most likely to succeed? The latter, certainly.

From which alone may be demonstrated the cause why plants of this description surpass those of a larger size, as above stated. These are raised with unbroken, tufty, and fibrey roots. Those with maimed, lank, fibreless ones; nor do they, by the greatest skill and attention, bear such proportion to the top. Consequently, the fibrils cannot

afterwards, by the utmost efforts of human art, be induced so immediately to seek pasturage for the sustenance of the trunk.

It may be argued, that by lopping the top, this difficulty is obviated. True, it is so in a great measure. But is the tree not hereby injured? I answer yes, inasmuch as *all* constraint is hurtful in a greater or less degree; that *least* wounding is *most* to be advised; and that wounds sooner, and more effectually heal in young than in old plants.

Moreover, are not the larger roots of old plants which are wounded in the operation of removing them, liable to canker, and even induce the *rot* upwards, to the detriment of the trunk, if, by chance, the tree be placed in ungenial soil?

Could the hidden works of nature be fully explored, it is more than probable we should find, that hence proceeds, in a great measure, the frequently sudden decay of old trees, and the languishing state of young ones. But of this see more in Section X. of this Chapter.

I come now to the consideration of parti-

culars. For the most exposed, bleak sites, and where the soil is poor and thin, one-year seedling Larches, nursed one season ; two-year seedling Ash, Mountain-Ash, Birch, Elm, Hornbeam, and Sycamore, also nursed one season ; two-year seedling Beech, Oak, Chesnut, and Horse Chesnut, nursed two seasons, whose roots have been *tapped*, as directed in Chapter III. Section II. Two-year seedling Scotch, Common Spruce, and Silver Firs, which have stood thin in the seminary, and are *well* rooted ; are of the *age* and *size* admissible, and from which there should be no deviation, if the plants have been properly treated, and are healthy.

For less exposed sites, and where the soil is generally found from six to twelve inches in depth, all the above deciduous kinds may be nursed a second year in the same rows, except the Larch ; which, if nursed a second season, must be removed into fresh rows ; but plants of the above description will be found to succeed best, not only here, but in *all* situations. Two-year seedling Firs of all kinds, except the Scotch, being also

nursed in the same row for two seasons, are fittest; but strong two-year seedling plants of the former, are most advisable.

Lastly, for the most favourable sites, and where the soil is found good, and of great depth, plants of all kinds may be nursed still another year, if the desire of an *immediate figure*, predominate. Otherwise, it is not necessary. In this case, however, the plants should be removed into fresh nursery rows the season previous to final removal. And, if an extravagant desire for *immediate figure* yet prevail, the plants may even remain a second season in these rows. But, beyond this, nursing borders on absurdity.

The reader is particularly requested to observe, that what has been advanced in the preceding part of this Section, respects *trees for the forest only*; and that, therefore, the subject is treated *in a general manner*. Of plants for the decoration of the Park, for Pollards and Hedge-rows, the proper age, size, and all other particulars will be defined in the next Chapter,

But I would beg the indulgence of one general remark. If real utility, and a desire

of cultivating useful timber, either for the service of the present, or the good of future ages, be the planter's object, his duty is to plant well-rooted, healthy, *young* plants, in all soils and situations whatever.

These will never fail to succeed, if even common attention is bestowed on them. Removing and planting *large* plants is expensive, little understood by the labourer, liable to many inconveniences, and to injury by the vicissitudes of weather ; nor has the result generally justified the practice ; but on the contrary, baulked the planter's more laudable intentions, by disappointing him, not only of present gratification, but of future gain.

SECTION III.

On the Distance at which the Trees should be planted, according to Situation, Soil, the Size and Extent of the Plantation, &c.

1st. FOR the most exposed, bleak sites, and barren soil, *from thirty to forty inches* may be considered as a good medium ; varying the distance according to circumstances. For, in an extensive tract, it will hardly happen that there is not a variety of soils. Some parts may be deeper and more loamy ; others more gravelly or rocky. In the former, the greater distance may be advisable ; in the latter, the lesser. But here, the safe side to err on, is planting *thick*.

2dly. For less exposed sites, and where soil is found above six inches in depth, from four to five feet will be a good medium ; varying the distance according to circumstances, as above.

3dly. For belts, stripes, or clumps, whose breadth or diameter do not exceed a hundred feet, lying in a bleak situation, and of

thin soil, the margin, on all sides, should be planted at not more than two feet apart; the interior parts at three. Those lying on a more sheltered situation, and of deeper soil, may be allowed *distance* according to circumstances. But narrow stripes, or small clumps, even if the soil may be termed *good*, should generally be planted *thicker* than a more extended mass, that the plants may afford each other shelter.

4thly. For the most sheltered sites, where the soil is deep, good, and where apparently *every* plant will grow, six feet will be a good medium distance. Wider than this, I cannot approve in any case whatever: because, at this distance, the plants have room to grow till their *thinnings* would be useful. But even, were this not an object, there is a greater; namely, that the plants may not grow too squat in their infancy, and that the "pruning hook" be not *much* wanted in the formation of stately timber. But of this, see Section VIII.

Again, he who plants *too thin*, with the idea of saving trouble in *thinning*, deviates as widely from the *right path*, as he who

thins none at all. Wherefore, I again repeat, that *thick*, rather than *thin* planting, is the safer side to err on. By which mode, also, there is a more equal crop on the ground, *beeting* being much less necessary.

And here I cannot help observing the very erroneous idea of those, who, in all situations, plant the *thinner* in proportion as the plants are *larger*. For my own part, did I approve of planting with *large* plants, I would act diametrically opposite. And surely proofs are not wanting every season to support me in this resolution; since, in all soils and situations, we find not *one small* for *three large* plants fail, if impartially treated.

In respect of arrangement, i. e. whether the trees be planted in lines or promiscuously, I hold it a matter of little moment. It can have no effect whatever on the growth or future welfare of the plants. And by the time the plantation is finally thinned out, it necessarily becomes irregular, although planted in line; since it is the distance of the tops, not of the roots, which must regulate the thinning. Nor does the head of *every* tree rise perpendicular to its root: some stand

erect, some recline, and "some do gently nod."

When the culture of a *vegetable crop* among the trees is intended, although it is not absolutely necessary for this purpose that they stand in line; yet it facilitates the operation of *cropping* considerably, while continued. Think not I allude to ploughing or horse-hoeing. I disclaim the idea of a horse or bullock ever entering here, from the day the trees are planted, till they are at least a foot in diameter.

In all cases, except where the culture of vegetables is intended, the promiscuous method of planting is to be advised; merely because it is least troublesome. Indeed, in some situations, *lining* is hardly practicable. On all uneven surfaces, it is perplexing in a greater or less degree.

SECTION IV.

On the Mixture of the different Kinds, their relative Situations, most proper Nurses, &c.

1st. OF THE MIXTURE OF THE DIFFERENT KINDS. Opinions vary so much respecting this point, that it is with considerable diffidence I enter on the subject. Nor can I, on any other account reconcile my own practice of planting many kinds *en masse* instead of distinct groupes, than that thereby is discovered with greater certainty *which* is best adapted to the situation and soil: a point not unimportant; for the most sagacious will acknowledge, that in this he has been often deceived.

I have already said that this is the best criterion in a doubtful case. All extensive planting affords many such cases. Nay, even in a single acre we often meet with soils different in texture and depth; and with those which are, *stratum super-stratum*, also different; the under one being not un-

frequently best fitted for the nourishment of trees.

Except for the above causes, fancy should be indulged in the first outset. It matters little whether we plant in distinct groupes or in indiscriminate mixture; provided, in the latter case, we ultimately retain the most profitable and flourishing kinds *only*. For, with the *proof* also that *most* of the kinds evidently adapted to the soil and situation be planted, according to the mode of *thick* planting, a sufficiency of *them* will remain, after all others are thinned away, for a full and final crop.

For instance, if it shall be supposed that the soil is *best adapted to the Oak*, that it is desirable to raise the most valuable kinds rather than the decorative; and that, *exclusive* of the Larch for *nurses*, and a few Firs to enliven the borders, six kinds are to compose the mixture; plant two Oaks for one Elm, two Elms for one Beech, two Beeches for one Ash, two Ashes for one Birch, and two Birches for one Sycamore.

And thus will the plantation at once be

formed, in uniform gradation, of kinds most likely to succeed each other, in the case of either disagreeing with the soil or climate; and which also succeed each other in respect of value as timber: doing justice at least, to the patriotic intention of the *planter*, should the first and more valuable kinds fail.

Some are advocates for planting in *groupes*, from the idea that there is an antipathy between trees, or that the shade of one kind of tree is hurtful to another. That the shade of any one tree is hurtful to another, cannot be doubted; but that there is an antipathy between the kinds, seems a doctrine founded in chimera.

That the *drop* of one kind is hurtful to another, is also advanced in support of this mode of planting, and the Ash is generally held out as an example. If one Ash tree overhang another, or if an Elm overhang an Ash, is the consequence different? Does not every tree, who lords it over his neighbour, not only *overdrop* him, exclude him from sun and air, but also cut off his food, by greedily extending his roots, and devouring his portion? Hence, the Ash has gene-

rally been quoted for the support of this argument, from the circumstance of his being a quick grower, and great impoverisher of the soil, to the detriment of his fellows in all *mirt* and *neglected* plantations.

Others, in ornamental scenery, contend for this mode of planting, that there may be less *sameness* in the object, and that the different shades may be more strongly marked. The idea would be just, and founded in reason, could we arrest the sun and the seasons, or make the hue of any individual permanent. But, how often is the whole "turned into ridicule" in one day, by the sun now shining bright upon it, and then withdrawing behind some cloud!

However, for the above object, I contend not *which* is the most advisable mode; the subject being foreign to the intention here, which is simply to set forth the most advantageous method of *mixture* for the cultivation and production of useful timber, according to soil, or the best judgment which may be formed of it.

Wherefore, the rule ought to be, *grouping*, if the proprietor's fancy so incline, and the

soil which will positively produce each kind in perfection be *present* and *distinguished*. Otherwise, plant in *mixture*, and of the kinds most obviously adapted to the nature of the soil and situation, in greatest quantity; as being the less hazardous method, and that which admits of greater variety.

2dly. RELATIVE SITUATION, by which is to be understood, in respect to one another; and also, locality in the site.

Thus, we may class, first, the aquatics, as the Alder, the Poplar, and the Willow; secondly, the sub-aquatics, as the Birch, the Lime, and the American Plane; thirdly, those which affect a deep sound earth, as the Oak, the Elm, the Ash, the Chesnut, and the Walnut; fourthly, those which become most valuable on sandy or gravelly soils, as the Hornbeam, the Mountain-Ash, the Beech, the Larch, and the Sycamore; and fifthly, the Pine tribe, as the Scotch fir, the Spruce, and the Silver-Fir, as bearing *some* affinity in their habit and inclinations, respectively to each other.

Hence, it would appear, that if the soil and situation suit the Willow, it will also suit the

Poplar and Alder; if it suit the Oak, it will also suit the Elm and Chesnut; and if it suit the Beech, it will also suit the Larch and Sycamore, &c.

Of this there can be no doubt. But the position may be so altered as to hazard success. For instance, the Elm will always thrive with the Oak, but the Oak will not always flourish with the Elm; the Birch will always flourish with the Platanus, but sometimes the Platanus will not even live with the Birch; nor will the American Spruce, in all cases, with the Native Pine. Not so with the Beech, the Larch, the Elm, the Hornbeam, the Sycamore, and the Mountain Sorb; these are more faithful companions; nor will the one desert the other in sickness, or *this* droop where *that* reareth his head.

From this view of the subject, it will not be difficult to assign to each its situation *relative* to the other. Let us therefore consider what respects *locality in the site*.

And first, of those sites which extend over a considerable tract, where both soil and situation are varied, and where the *chief object* is the culture of *valuable* timber: In the *most*

elevated, bleak parts, and where the soil is poor, thin, and gravelly, the Birch, the Beech, the Elm, and the Larch, are the kinds which most probably will succeed, and of which *most* should be planted; next to which follow in value, the Scotch Fir, the Hornbeam, the Sycamore, and the Mountain Sorb. In the *less* elevated parts, and where the soil is thicker, although poor, the Oak, the Ash, and the Norway Spruce may be added to the above. And, in the *most sheltered* parts, and where the soil is also found deep, the Oak, the Elm, the Larch, the Ash, and the Beech are objects of the first importance; next to which follow the American Spruce, and the Silver Fir.

Secondly, where the object embraces both the culture of *valuable* and *decorative* timber, to the above kinds may be added, the Chesnut, the Horse-Chesnut, the Laburnum, the Lime, the Poplar, the Platanus, the Walnut, the Willow, the Cedar, the Weymouth Pine, &c. which should be varied in quantity on the respective parts of the site, according to the soil *most evidently* adapted to them, and the leading features of the design; as, the

decoration of the outline, the decoration of interior walks or rides, the decoration of any part which is an object from a particular point of view, &c.

Thirdly, where the object is the culture of *decorative timber chiefly**. The Oak, the Beech, the Chesnut, the Horse-Chesnut, the Lime, the Platanus, the Poplar, the Sycamore, the Larch, the Weymouth Pine, and the American Spruce, are objects of the first importance, and are to be varied according to circumstances, as above.

Fourthly, aquatic parts. The Alder, the Poplar, and the Willow, are the kinds most likely to succeed; but the Birch, the Elm, and even the Oak, in some cases, may be added with success; as, the Elm by the sides of rivers or pools which *only sometimes* overflow their banks, and where the soil is sandy or gravelly; the Birch in like situations, and where the soil is either such, or more loamy; and the Oak, at the conjunction of marshes and the higher ground which form their li-

* The reader is requested to keep in mind, that this is a *treatise on timber only*; Shrubs, or their culture, forming no part of it.

mits, and where the soil is deep, loamy, and sub-humid.

But here it is impossible to give examples which will answer in *all* circumstances. *Much*, therefore, is left to the discretion of the planter, his judgment of the soil, and other subordinate considerations, which must ever depend on a variety of cases.

3dly. MOST PROPER NURSES. It is now proved beyond a doubt, that in *all* situations, and on *all* soils, except those termed *humid*, and which are adapted to the aquatic kinds *only*, the Larch is the *most proper* nurse, and therefore, should take preference of all others for this purpose.

On sub-humid, or loamy soils, the Lombardy Poplar, and Huntington Willow are good substitutes; and when variety is the object, ought to be mixed with the Larch, for the purpose of nursing the other more valuable kinds.

On elevated, poor sites, the Mountain-Ash, for the first ten or fifteen years, is outdone by the Larch *only*, in the office of nursing, and is justly admitted for the sake of variety. In all situations, this plant grows

apace in youth, which constitutes the *chief* property of a nurse.

In maritime situations, the Sycamore is *eminently* useful for this purpose. Few trees grow faster in youth, (perhaps only the preceding) and *none* are more patient of the sea breeze. Consequently, when the site is much exposed thereto, this tree should be freely planted in mixture with the Elder and the Larch, for nursing the Oak, Beech, Elm, &c, if the intention is the culture of ship timber; an object so desirable, that the culture of all others *here* ought to become secondary.

The Native Pine has long been planted as a nurse, but the practice is now much relinquished. Nor is it founded in reason; since there is no soil or situation in which the Larch and Mountain-Ash will not far surpass it in growth while young. Nevertheless, when variety is the object, it should not entirely be excluded—a few may be interspersed.

Others than the above named cannot properly be enumerated as* *nurses in the forest*.

* Nurses in the Shrubbery, or decorative plantations, may consist of a much greater variety. All kinds of

For, to this office, the faster growing kinds *only* are appropriated ; and not, as has been erroneously supposed by many, the *least* valuable. Their value for this purpose consists in a quick, upright growth in youth, and also a multiplicity of branches, which break the force of violent winds ; thereby affording shelter to others in infancy, and inducing in them an upright growth, when prone to grow crooked in the stem or squat in the head, by being placed in an exposed situation, or poor soil.

If the utility of *nursing in the forest* be admitted, it precludes the idea of *grouping* at the time of planting ; and if grouping at first be determined on, it precludes the idea of nursing at all. For, in the present sense, we do not suppose that one kind can be nursed but by the aid of another ; although it must be admitted, that by *thick* planting, the same kinds may operate, in some measure, to nurse one another.

This is a strong argument in favour of

Poplars, Willows, Birch, Laburnum, the Larch, Lime, Mountain-Ash, Horse-Chesnut, &c. may be admitted according to taste.

planting in mixture, since by help of free-growing nurses, the plantation acquires *figure* much sooner; and the *valuable kinds* form for "timber of stature" from infancy without *much necessity of chastisement*, provided proper attention be paid to *removing the nurses in time*, that the timber be not drawn up too weak and slender.

Nevertheless, when the ultimate intention is *grouping*, and when *that* formality is dispensed with at first, or until the plantation hath acquired considerable *figure*, nursing may be effectually practised, by planting, perhaps Larch, Poplars, and Mountain-Ash, as nurses over the whole; or perhaps only one of these kinds, as may be determined by choice or existing circumstances.

In respect of the quantity or number of nurses, and what proportion *that* should bear to the intended crop, much must depend on circumstances. In a thin soil, and bleak situation, perhaps tree for tree may be requisite. In a less exposed situation, and better soil, perhaps there should be one nurse for two principals. And in the most sheltered situations, with good soil, perhaps one nurse

for three, four, or five principals, may suffice.

The judicious will distinguish between the extremes, and according to the probability of success. But I beg to remark, that for the most exposed, bleak situations, and where the soil is evidently sterile, the safer way is to plant too many, rather than too few nurses; and, that here the Larch and Mountain-Ash are fittest for the purpose, unless the site is exposed to the sea breeze, in which case, the Sycamore and the Elder, ought to take place of the latter.

And here I cannot avoid taking notice of the super-excellence of the Larch in this particular, *viz.* that while it is admirably adapted to the office of nursing others, it is by none, except the Oak, excelled as a timber tree. Hence, there is hardly a possibility of erring on the score of planting too many Larches for the purpose of nursing, especially on thin soils and bleak exposures; since, although the intended kinds fail, if these survive, there will remain no want of a valuable crop on the ground.

SECTION V.

On PLANTING ; the proper Season and Manner of performing THAT Operation.

1st. THE PROPER SEASON for Planting, may *generally* be, from the first of November to the middle or end of March, according to the forwardness of the spring. This latitude is granted on the presumption that the *scene of Planting* is extensive ; in which case, every favourable opportunity is to be embraced, that the whole may be completed *in good time* ; observing to plant the dry, elevated parts in the early, and the more humid and loamy, in the latter part of the season.

This precaution becomes necessary for two reasons : first, that the trees planted in the dry, elevated parts may reap the advantage of the winter rains, put forth fibres early in the spring, and be better enabled to endure the early summer drought, which is so fatal to new planted trees on a dry soil, and elevated situation ; and secondly, that those

planted in the humid or loamy parts may not be spewed out of the ground, by severe frosts. From the first of November, to the middle of February, is a good season for the first object; and from that time to the middle or end of March for the latter.

But the season of Planting may be regulated by other circumstances. If the *Planting* can be accomplished in a few days or weeks, if the soil is of a middling texture, and the field flattish, perhaps the end of January and first ten days of February will be the most eligible time. If the season proves wet, and the site required draining in the preparation, perhaps the land may not be in proper condition for planting before the middle of March, or first of April; for it is of equally bad consequence to the welfare of the plants, if they are committed to the soil in a sour and wet, or in a dry parched state.

At a time when the soil is neither wet nor dry, the operation of planting is most easily, and also most successfully performed. The mould adheres not to the spade, nor does it *run in*; it divides well, and with little trou-

ble intermingles with the fibres ; nor, in the operation of treading and setting the plant upright, is it wrought into a mortar, to the evident prejudice of the plant, whatever weather may ensue.

Consequently, on a retentive soil, it cannot be proper to plant in time of rain, nor, in many cases, for a day or two afterwards ; nor after a fall of snow, until for several days it has entirely disappeared. Whereas, on a dry absorbent soil it may be very proper to plant in time of gentle rains, immediately after heavy ones, or so soon as the snow is melted.

And, since I have mentioned snow, I shall here observe, that by reason of it, on very bleak mountainous situations, it may frequently be impracticable to plant till *late* in the spring. In this case the utmost diligence should be used, from the moment the work can be set about, till it is finally accomplished ; by employing a proportionate number of hands, so as that the plants may be got *in* before vegetation be *far* advanced ; as otherwise success would be rendered doubtful, not only on account of

parching drought in the early part of summer, but also that the tender foliage might be much injured, nay, entirely blasted, by prevailing winds, before the roots begin to draw nourishment for their common sustenance.

The *kinds* may also, in some measure, regulate the season of planting, some vegetating more early than others. But this can only operate in the case of *grouping*, for in that of *planting in mixture*, it would be a very inconvenient matter to go over the ground several times; nor could the *mixture* be so minutely or regularly formed as at once.

In this case; *viz. grouping*, if the nature of the season, the soil, and situation, be no hindrance, or controul not the planter's inclination of planting each kind at *the proper season*, he should endeavour to have the Larch, Elm, Sycamore, Lime, Horse-Chesnut, Mountain-Ash, Birch, Alder, Poplar, Willow, &c. planted by the first of March, and the Oak, Beech, Ash, Chesnut, Hornbeam, &c. by the first of April at farthest.

The *most proper season* for the Cedar, the Weymouth Pine, the Spruce, Scotch, and Silver Firs, is from the 20th July to the end of August, taking advantage of wet or cloudy weather. These will also generally succeed well if planted about the end of April, and the ensuing summer prove moist.

2dly. MANNER OF PERFORMING THE OPERATION: The plants being prepared as directed in Section II. Chapter III. brought to the ground and *soughed in*, and the ground being prepared either by the plough and harrow, or by the spade, &c. as directed in Section I. of this Chapter.

First, the *mixture* being determined on, let the person in charge of the work distribute the plants by laying each on the *pit* in which it is to be planted, or if the ground is prepared by the plough *only*, at the distance determined on, as nearly as can be guessed by the eye; having a person or persons to carry plants from the *sough*. By this means, the *mixture* is more perfectly formed than when each *planter* (supposing there are several employed) is left to

mix his portion ; nor is his attention diverted from the main object, that of *planting well*.

This practice of mine has been objected to, on account that the roots of the plants are exposed to the air by being laid singly on the ground, *perhaps more* than if carried in the hand or lap in quantity. The objection falls to the ground when it is considered, that they are *no sooner laid down than planted*. If otherwise, the practice is not mine. For my method is this: the *mixer* traverses the ground, which is previously divided into convenient portions, from side to side before the *planters*, and at a distance of *never more than three or four yards*.

Now supposing each *planter* to take on a breadth of *eight yards*, and that the trees are set at a yard apart, it can never happen that more than *thirty plants* lie before him unplanted at a time ; and supposing *he* and his *boy* plant *fifteen hundred in ten hours*, it cannot happen that any one plant lies more than ten minutes exposed to the air, and consequently cannot be *much* injured. Whereas, by the common practice of carrying a bundle under the arm, it often hap-

pens that a plant is exposed to the air *for hours together*, by being jostled, approved, and rejected perhaps twenty times in seeking the proper kind for *mixture*. Thus, it is not uncommon to hear a dialogue of this kind: "Give me a Larch, boy—no, here's one at my back—a Beech." "There's a Beech at your foot, father." "Well, give me an elm." "You planted one last; will an Ash do?" "Aye—no, John has just put in one; give me an Oak, &c."

By this mode, is the *mixture* so well formed, are the roots of the plants less exposed; or, does the operation of planting proceed so fast, and with so little confusion as in that above stated?

Trivial as this matter may seem, it is of no small importance—it certainly merits our consideration. For, independent of the difference of injury done the roots by exposure, there is frequently more time wasted in looking for, and fixing on the plant, than in planting it; nor is it possible the *mixture* can be so *completely* formed.

In the case of *grouping*, or when two or three kinds *only* compose the *mixture*, and

when these last are to be planted alternately, it will obviously appear, that to *carry* the plants is the most advisable method. What has been said above, simply respects *planting in mixture* with *many* kinds, and each of various quantity. But one general rule ought to prevail in all cases: expose the roots to the air as little as possible, especially if it be sharp and frosty.

Secondly, let the *planters* follow. And from the above it would appear, there are two people to be employed together; that is, a man to *plant*, and his boy or girl to *hold*.

By the mode of preparation treated of in Section I. the *pit* has been dug several months; the surface is encrusted, and perhaps covered with weeds. He first strikes the spade downwards to the bottom, two or three times, in order to loosen the soil; then poaches it, as if mixing mortar for the builder; lifts out a spade full, and, if necessary, two, so as to make ample room for *all* the fibres, without being crowded together; chops the rotten turf remaining in the bottom, and levels the whole. The

boy places the plant *perfectly upright*, an inch *deeper* than when it stood in the nursery, holds it firm in that position. He *trindles* in the mould gently. The boy gently moves the plant, not from side to side, but upwards and downwards, until the fibres are covered. The man then fills in *all* the mould, and proceeds to chop and poach the next *pit*, leaving the boy to *set the plant upright*, and tread the mould about it, which in stiff wet soil he does *lightly*, but in sandy or gravelly soil until the surface no longer bear the impression of his foot. He has now got the *pit* ready for another plant : the boy is also ready with it in his hand. And so forth.

Thus the business proceeds mechanically : neither is the attention of the *one* or the *other* diverted from the important point of performing his part *well*, by studying the less important one of *mixing* ; a matter more necessarily dependant on taste, and which cannot so much affect the general welfare of the plantation.

In all cases, *where the land has been prepared*, whether by *pitting*, ploughing and

pitting, or ploughing and harrowing, &c. I cannot admit of a deviation from the above practice.

It borders on absurdity, to make a gash, in tilled ground, perhaps, and thrust in the roots by force ; probably with more trouble than by taking out a spadeful, and inserting the plant in such a manner as that the mould may be *intimately mixt* with its fibres ; a matter of evident utility and benefit, whether considered in the light of enabling the fibrils more readily to seek pasturage in the soil, or that thereby they are not so liable to be injured by parching drought. For it frequently happens, that if the soil is moist at the time of planting, in the former case, the gash seems to be closed at top, while, in fact, it remains open ; which is shown by the first succeeding drought, and if not closed ; by the consequent languishment or death of the tree.

On very steep *hangs* which have been *pitted*, the following rule ought to be observed in planting : Place the plant *in the angle formed by the acclivity and surface of the pit* ; and in finishing, raise the *outer margin* of

the pit *highest* : whereby the plant will stand as if on level ground, and the moisture be retained in the hollow of the angle, evidently to its advantage.

Thirdly, planting by *slit*, or the letter T as commonly termed. And here I must declare, that I am no advocate for this mode. It should never be practised except where there is no more soil than is absolutely occupied by the fibres of the herbage which grow thereon. Except on turf, it *cannot* be performed ; nor should it, if the turf is found *three inches thick*. By the mode of preparation already shown, *that* turf is capable of being converted into a proper mould in the space of a few months. The expence of pitting can never counterbalance the risk of success, in the eye of an ardent planter.

The method is this : Strike the spade at random, to the depth of the turf ; strike it crosswise at the end of this incision, and at right angles with it, sloping the spade considerably outwards in the mouth, so as that its handle form an acute angle with the surface ; press the hand towards the ground, until the gash is sufficiently opened to re-

ceive the roots of the plant without difficulty. The boy then having the stem of the plant in his hand, the top *inside* of the arm, and standing *opposite*, smacks the root upon the plate of the spade, draws it gently into the gash; the spade is eased upwards until the plant become upright, and then is drawn out; the boy holds the stem in that position, and treads the turf close down.

Some, before treading down the turf, chop it, all round the stem of the plant. This is an error. It is done with the idea of keeping the *slit* from opening in dry weather, by which the roots are parched. But they are much more so by the opening of *many slits* than *one*. This objection, in fact, is sufficient to do away the practice of slitting.

It is imprudent to perform the operation of *slitting* if the turf be not in a moist state; as otherwise, it cannot be so well closed down. On all steeps, the plants should be placed *towards the declivity*, that the moisture may fall to its roots. That is to say,

in planting, the spade-man should stand uppermost, and the boy or girl undermost on the bank ; by which, the plant will be inserted at the lower angle of the gash or slit.

Finally, the operation of *planting*, in whatever manner performed, being of the utmost consequence to the immediate and future welfare of the tree, too much care can hardly be bestowed on it. Nor should he who performs his part *well*, if diligent, be chid for doing too little.

SECTION VI.

On Sowing Acorns among Planted Forest Trees.

IT is a fact which admits not of doubt, that Oaks, *sown* where they are to remain, outdo *planted* ones in growth, and also become the most graceful trees, unless the latter be *headed down to the ground* about the third or fourth year after planting. If we enquire into the cause, it will be found owing to the Oak being a tap-rooted plant, bearing transplantation *with less patience* than most other forest-trees, and from the check it receives in removal, being afterwards prone to grow crooked in the stem, and squat in the head.

Those who are advocates for *planting* rather than *sowing* Oaks, endeavour to obviate these objections thus : Tapping in the nursery ; by which their roots, ever after, have a horizontal tendency ; nor are liable to injury by insinuating themselves downward into bad soil ; and a plentiful planting of nurses, to draw them upright, preventing the necessity of *heading down*.

THE UNITED STATES OF AMERICA

TO THE HONORABLE SENATE OF THE UNITED STATES
IN SENATE,
January 1, 1901.
REPORT
OF THE
COMMISSIONER OF THE GENERAL LAND OFFICE
IN RESPONSE TO A RESOLUTION PASSED BY THE SENATE
JANUARY 1, 1899.
WASHINGTON:
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timber without afterwards being *headed down*, to cause them to *push a stronger stem*.

And it is a happy circumstance, that by simply *heading down*, and previously *tapping* in the nursery, *planted Oaks*, in most cases, come little short of *sown* ones. For, it is frequently very difficult to rear a field of *sown Oaks*; the seed being so much a prey to mice and other vermin;

However, that the *planter* may have it in his choice, and be enabled to take advantage of every favourable circumstance, I will briefly set forth my own practice of sowing acorns among planted timber of all kinds, and of which the *Oak* made a part. For I hold it advisable, in order to rear this valuable tree, that both methods be practised in the same field, provided well ripened, healthy seed can be procured.

The acorns may either be sown the *second* or the *third* season, after the field has been planted.

This is advisable, first, that the *planted* trees may be established in the soil, and begin to afford shelter to the *sown* ones as they rise; and secondly, that, as many of the

planted trees will fail, by sowing their *pits* with acorns unnecessary expence in *beeting* may be saved. But, later than the third season after *planting*, unless the situation is very bleak, and the planted trees are making little progress, it would be imprudent to *sow* ; since, particularly if the soil be rich, the *sown* plants might be drawn up too weak, or be choaked by the *planted* ones.

The *only* necessary implement for this business is *the hand mattock*. The handle is eighteen inches long ; the head about fifteen, having one end resembling an adze, four inches broad in the face, and the other a pick, about ten inches in length, tapering, and sharpened at the point. It resembles a *tomahawk* with the face of the axe reversed, so as to cut at right angles with the handle.

The season for sowing is, *all* the month of April. *Three nuts* are to be sown in *each patch*. I have been accustomed to place the patches at from twenty-four to thirty feet asunder each way, according to the quality of the soil, and probability of success. Also, varying the distance for the sake of sowing in a formerly made *pit*, out of which

a planted tree had died. But, as I have never *sown* acorns on a *bad* soil or *much* exposed situation, in this case I would rather advise that the distance from patch to patch be *within twenty feet*.

Proceed thus: With the broad end of the mattock, pare off the turf, weeds, &c. as thin as possible, which throw aside; with the pick end, stir the soil to its *full* depth if less than nine or ten inches, and to the extent of a foot diameter; make three holes as with a *dibble*, using the handle for this purpose, three inches deep, and six apart; in each drop an acorn, and close them with the foot. And so on, until the sowing be completed.

About midsummer, let the field be gone over, and all the patches, whether the plants have then appeared or not, be cleaned of weeds, &c. By the middle or end of May following, the plants will *all* have come up. Clean the patches at this time, and also about midsummer. Next March, go over the field; single out *the best plant* in each patch; take the others carefully up, and carry them to the nursery.

The further treatment of the *sown* Oaks, when different from that of *planted* ones, will be found in the succeeding Sections of this Chapter.

SECTION VII.

Culture.

So far as respects *keeping* the ground with the *hoe*, where practicable, or otherwise destroying noxious plants, as whins, broom, bramble, fern, &c. till the trees are established, and fairly overtop them; also, *beet-ing*, or filling up of vacancies, &c. is the subject of this Section.

1st. OF KEEPING THE GROUND WITH THE HOE. That, by doing so, the trees, in most cases, reap infinite advantage from the practice, cannot be disputed. But, in *extensive planting*, the expence is generally an insurmountable obstacle. However, there are some instances where even prudence forbids the practice. These are, light sandy or gravelly steeps, and in all cases where *slit planting* is performed.

No doubt, by cultivating vegetables, as potatoes, cabbages, carrots, &c. amongst the trees, where the soil is good and adapted to the purpose, the expence of keeping the ground clean may be *more* than defrayed. But who will dispute, that to keep the ground equally clean, *without* growing these crops, would be more advantageous to the timber trees?

It may not be difficult to prove, that, in many instances, instead of the timber crop being *benefited*, it is *impoverished* by the culture of vegetables; which, through niggardliness, for want of manure, and by being too long persisted in, frequently operates much more to its injury, than if the ground were suffered to run *wild with weeds*.

Yet, when performed *with discretion*, the practice of growing vegetables among planted timber is highly commendable. In this case, the timber is the principal, and the vegetables the secondary object; otherwise, the practice is not founded in reason. I would have the subject viewed in this light: Grow so many vegetables *only* among the trees as you think will defray the expence

of hoeing, &c. This is the safer side of error.

And who, with all his heart, would bestow a portion of ground on the cultivation of *timber*, and afterwards say to himself: "I have done wrong, the ground will produce good *vegetable* crops; I don't much care for the trees, they will fight their way; I have a mind to make the most of the land, and will have it fully cropped with vegetables," &c.?

No: either stub the trees up at once, leave them to nature, or bestow a rational culture on them. But be assured, that, by the latter, whatever may be the quality of the soil in question, they can be replaced by no crop whatever ~~that~~ will *ultimately* pay so well for the trouble.

How long this trouble, namely, of hoeing, &c. should be continued, is discretionary; but whoever practiseth it *to the fourth year*, renders the plants a manifest service, and which, by their after-progress, they will amply reward. Cropping with *vegetables* should not be persisted in beyond this time. The roots of the trees will now begin

to *run*, and might be injured by digging and preparing the ground for the vegetable crop.

2dly. DESTROYING NOXIOUS WEEDS, as whins, broom, bramble, &c. until the trees are established and overtop them, is eminently useful. This, however, is subject to restrictions.

In *sheltered* situations, the *whole* ground is to be cleared of these plants. Not so in bleak exposures. Their presence here is even desirable. A young growth of whins, broom, &c. *rushing up* with the timber crop, act the part of nurses completely. But here *observe*, the pits, or a space of eighteen inches around the trees, is to be kept clear ; retaining such whins, broom, &c. *only*, as are placed in the centre of the intervals : thus forming, as it were, a mixt plantation of timber, whins, and broom ; the latter, by the shelter they afford, evidently operating to the benefit of the trees.

But the reader is particularly requested to discriminate here, that errors may be avoided. The points for consideration are, whe-

ther, in all probability, according to situation, the trees will be benefited by the shelter afforded as above, until they are established in the soil ; or, whether they will not rather sustain injury by the whins or broom, through luxuriance of growth, impoverishing their pasture.

In the first case, the rule is, keep the tree so far clear, that at no time, in the most severe gale of wind, its top or branches be *whipt* by the whins or broom ; and in the second, go over and clear the whole ground annually, until, by the trees overtopping and overshadowing them, they become so weakened in growth, as to be of no farther injury to the timber crop.

And for this purpose, my practice has been, to perform the operation in April, when the weeds are just taking their spring growth, and full of sap ; using the spade *alotte*, previously *well sharpened*, for the sake of facility : and it is surprising what progress a diligent person will make. The plants are brittle, being full of sap ; the spade, by the width of its mouth, takes on a good

breadth; and the position the person stands in, when chopping, is less irksome than it would be, by using any other tool.

It may be necessary to remark, that, if the weeds, &c. are not cut annually from the beginning, or at most every second season, perhaps the spade might not be effectual; and consequently, a *greater* expence might be incurred by the necessity of using the whin-axe or bill-hook. Of this, I have had proof sufficient to determine me in following the above practice.

Besides whins, broom, bramble, briar, &c.; in many soils, ferns rise luxuriantly, and, if not destroyed, choke the trees. Where this is the case, the plantation should be gone over at least twice in the course of each summer, until the plants are no more liable to injury; and the pits, or a space around the tree as above, should be cleared; using, for this purpose, the *semicircular weed-hook*.

Finally, After bestowing the expence and trouble of planting, fencing, and the necessary accompaniments, *with-holding*, for a few seasons, the farther *trifling* expence of keeping the plants clear and unincumbered

by noxious weeds of any kind, until they rise "superior to them all," would seem to *ill become* HIM who is at all anxious for the welfare of his plantations.

3dly. BEETING OR FILLING UP OF VACANCIES occasioned by the death of planted trees, that there may be an equal crop on the ground, is an indispensable duty.

It not unfrequently happens, however, that, by *too* implicit an obedience to that duty, much money, and thousands of trees, are wasted. How often do we see two plants rising within a few inches of each other! This is occasioned by impatience. To *plant* this year, and *beet* the next, borders on folly; unless the ground be kept with the hoe, or that the place of every tree be distinguished, so as to ascertain whether it be dead or alive.

And this *alone* is a sufficient reason for keeping the pits clear, as above, on all *rough surfaces*. Nor would the expence, in general, equal that of putting in unnecessary plants, independent of the advantage the crop would reap by being kept clear.

But if this is not the case, and in all in-

stances of *slit planting*, the third or fourth year should arrive before a general revision or *beeting* take place. By this time, the plants will be, *visibly*, either in a dead or flourishing state; for it frequently happens that many of the deciduous kinds, particularly if placed in a bleak situation, or if the first summer prove dry, will die down to the ground, push *weakly* the second season, and *vigorously* the third. By this time, also, the *sown Oaks* will have made their appearance, and, perhaps, will have supplied the place of many dead plants.

However, by the fourth year, the plantation should be gone over and *filled up*, that the crop may rise regularly in all parts, and that the *beeted plants* be not drawn up too weak, or be choaked by the others.

It may be unnecessary to observe, that, where *pitting* is practicable, the pits should be made the preceding summer, as directed in Section I. of this Chapter, that the ground may undergo the operation of fallowing: an article the more obviously necessary for forwarding the growth of the plants, so as they

may overtake the others in growth, and afterwards keep pace with them, if possible.

And here I cannot avoid remarking the almost universal *error* which prevails in *beeting with large plants*, in all cases, that the plantation may more immediately appear complete. Could we stifle prejudice, and appeal to impartiality, nor close our eyes from the light which so forcibly beams upon them, we would at once discover, that this, namely, planting *large plants*, not only *chiefly*, occasions beeting at all; but, in this case, renders it necessary for many successive years.

SECTION VIII.

On Pruning.

No. part of the culture of timber is more important than that of *Pruning*. That we may be enabled to follow the subject clearly, and bestow due attention on valuable individuals, let us proceed with,

1st. THE OAK. And, as already hinted, *planted Oaks generally require to be headed down*, about the second or third year after planting. I say *generally*, for who in madness would head down a plant, evidently thriving, and forming for a *timber tree*? In speaking of *heading down*, I allude to *bushes*, or plants so distorted in the stem, that they will not, if left to nature, hastily acquire an upright tendency, and consequently might disappoint our best wishes of seeing them speedily shoot forth for timber of magnitude.

Therefore, to remedy this defect, the third season after planting, by which time the plants will have made good roots, and be

established in the soil, go over the field, and head down, to within two inches of the surface, every Oak of the above description; making clean wounds with a sharp knife. Such plants as have a good leader, and clean smooth stem, are not to be touched; and most of the sown Oaks will come under this description. The season for performing this operation, is November or March.

The plants thus treated will push vigorously the ensuing season; and about midsummer, they should be looked over, and divested of all but two of the strongest shoots, by simply rubbing off the others with the finger. Two shoots are retained, in case of accidents, until March following; at which time, the weakest, and also any other trifling ones that may have issued in consequence of rubbing off those in the preceding summer, are to be lopped clean off by the stem.

At midsummer next following, the plants are again to be looked over; and whatever spray may have issued from the incisions, displace with the finger.

Henceforth, the plants will require no more attention on this score, but will be-

come fine single-stemmed trees ; and must be treated, along with the sown plants, as follows :—

Encourage a *leader*, by *shortening every branch which seems to rival the stem* to about two-thirds of its length. These are not to be lopped off by the bole, but shortened at some convenient twig or lateral, which may become an inferior leader to the branch ; to the intent that the trunk may be strengthened in its annual progress, by the retention of branches, which, although they serve to *detain the sap*, may not, by their strength or luxuriance, operate to weaken the main stem or leader of the tree.

The whole art of pruning and training timber centers here. The stem is not to be smoothed up like a May-pole, by being divested of *every* twig and branch without discrimination ; nor is the top to be let grow as, or be formed into, a *bush*, without being thinned. There is a medium, and to hit on this medium is all that is required in the formation of beautiful and stately timber. Nor is it necessary to exercise the knife *much*, or lop a single branch by the bole,

unless decayed or broke by accident. All that is necessary is shortening *strong* branches, such as, in any considerable degree, seem to cope with the stem.

And this must be persevered in so long as the intention is to produce *straight timber* : First, By aid of light ladders, after the plant *shoots* beyond reach from the ground, until of sufficient strength to bear a boy or other light person ; Secondly, By a person mounting the tree with a light sharp bill, pocket saw, and knife. These are all the implements necessary ; and if the *pruning* is not neglected, but performed, as it ought to be, every second or third season, the amputation of no branch bigger than the wrist or ankle will become necessary.

The bill should have a light handle of three or four feet, and is to be used in shortening the distant extremities of branches not sufficiently strong to support a person's weight. The saw and knife are to be employed in shortening branches within reach, and taking clean off by the bole, *to the depth of the bark*, all accidentally broken or bruised stumps ; using the saw for *amputating*, and the knife

for afterwards *smoothing* the *edges* of the bark, and *face* of the wound. Of this, see further in Section X. of this Chapter. But observe, that no formerly lopped or shortened branch, having a twig or lateral to lead on its growth, comes under the denomination of a stump.

If, however, the extremity of any such branch exhibit the appearance of decay or mortification, let it be cut back to the *quitch*, or to the next twig or lateral thereon; smoothing it in the manner as above. And if it be corrupted *below all the twigs*, let it be taken off by the bole; as, in that case, it comes under the title, and would soon put on the appearance of a stump.

From this view of the subject, it is presumed the intelligent reader will find no difficulty in Pruning and Training the Oak in the character of *straight timber*; nor, if the operation is regularly performed, so as that the trees at no time be suffered to run into confusion of shoots, and if they stand at proper distances in respect to each other; (as will be fully explained in the next Section,) will he find the operation perplexing or tedious.

I come now to *Pruning and Training the Oak in the character of crooked timber.*

It may be necessary to observe, first, that from the natural inclination of the plant in question, there certainly will be less difficulty in training it in a crooked than straight position, provided a sufficiency of room be allowed. Secondly, that detached or hedge-row trees, those standing on the borders of plantations, or in open woods, rather than in close groves or thickets, are most proper for this purpose. And thirdly, we ought not to deem trees of from twenty to thirty years of age, too old for being thus trained.

Producing *cuts* fitted for *ribs* or *knees*, is the chief object here; and, to accomplish which, if we follow and improve the dictates of nature, will require little trouble or expence. That these knees, &c. be of the best quality, is a matter of the greatest importance to the ship-builder and mariner. Being produced from sound wood of the *trunk*, rather than brittle wood of the extremities, will encrease their strength and enhance their value,

All the *art* requisite for this purpose is, to alter the position of the stem or leader, by substituting in its place a side bough, from time to time, according to the progress of the plant, the size of the *bend* or *knee*, and the posture of the succeeding bough intended for a leader. The *care* consists in making clean and handsome wounds, and preventing mortification by the application of plaister, &c. of which see Section X.

I do not presume that *every* oak tree is to be, or *may* be converted to this use; nor even that a tree which is naturally fitted for *ribs* is to be trained for *knees*, or the contrary. But rather, that the natural *bends* be as little constrained as possible; taking advantage of such turns *only* as will evidently answer the purpose, whether of ribs or knees. And it will also frequently occur, that a bottom cut, both long and straight, and several knees, &c. may be had of the same tree.

It would now appear, that, to the manager of an oak wood, four important points for consideration present themselves; viz.
1st. Whether there is a demand for *crooked*

timber; 2d. Whether the probability of a demand; 3d. What demand for straight timber; and 4thly, Selecting and classing the trees, according to the purpose they will most obviously answer. This, however, is to be understood of neglected trees which have been planted many years; as I conceive it quite practicable to form lately planted *young* trees for any of the purposes above stated.

Thus, changing any particular branch, which forms a proper *bend*, into the principal leader, by stopping the stem so as that this inferior branch be placed immediately under the amputation; the new leader will soon after incline upwards, put forth lateral branches, and afford an opportunity of repeating the formation of another *bend*, &c.

In pursuing this object, however, care should be taken to reverse the bend or knee each time, lest the tree, by losing its proper poise, become subject to injury, or be thrown down by high winds. This should also be attended to in the case of its standing among other trees, that it take not up unnecessary room.

But, in preparing young trees for this purpose, it becomes necessary to deviate from the rules above stated, of shortening *all* branches which seem to rival the stem, and lopping *none* by the bole. All *strong* branches, except those intended to be changed into leaders, should be cut clean away ; as otherwise, they might retard the progress of the new leader, which, by its horizontal position, cannot be supposed to draw nourishment so effectually as if growing upright. Small branches may be left, however, on the stem ; as it is not probable they will push shoots to injure the leader, in the manner the *laterals* of shortened, *stronger branches* might.

Here I speak of trees under thirty years old ; and I hold it to be particularly injurious to lop branches by the bole from plants of greater age. If wounds on the *trunk* are not skinned over, and completely healed while it is clean and smooth, they do not so readily heal afterwards. This is peculiar to the Oak, and other *rough barked* trees ; while the Beech, and other *smoother barked* plants, will bear to be pruned to the bole, with equal propriety, at a greater age.

This matter, however, should be regulated by *the state of health* the plant is in ; judging by its vigour, whether, in all probability, it has strength sufficient *speedily* to cicatrize the wound.

But it may be necessary to observe, that if young trees are *properly kept in training* for this purpose, the necessity of lopping *strong* branches by the bole will rarely happen ; for, *shortened branches* become *twigs* in a few years, if a proper leader be encouraged. And this should be done for some twenty or thirty years, or until the trunk hath acquired strength sufficient to support the *head*, after being *laid* in a horizontal position.

2dly. THE ELM. I have already observed of this plant, (Chap. I. Sect. III.) that, if allowed room, its propensity is to grow crooked, resembling the Oak in form, &c. and may therefore, in many cases, be applied to the purposes of ship and boat building. (Observe, I speak of the rough-leaved, or Scotch Elm.) Therefore, what has been advanced above, on pruning and training the Oak, will equally apply to the

Elm. It is even frequently necessary to head down new planted trees, which are anywise stunted, in the same manner; not only of Elm, but of Beech, Ash, Sycamore, &c. Wherefore, to prevent repetitions, the reader is requested to observe, that all *lately planted* trees which are *not resinous*, and which are hidebound, or stunted, should be headed down to the ground, as the only *effectual* means of recovery.

They are afterwards to be carefully gone over and divested of the superfluous shoots, as directed above for Oaks.

Although the Elm is found useful in naval architecture, particularly for keels of small ships; and ribs, knees, &c. of boats and other craft, we ought not, from this circumstance, to think of training it for that purpose, except in situations where the Oak *cannot be easily reared*. Training it as *straight timber*, for the Pump-maker, the Carpenter, the Millwright, &c. will be found profitable in all districts of the country; and to render it the more valuable, every possible care should be taken to pre-

vent blemishes in the trunk, whether outward scars or inward *shakes*.

For this purpose, the tree should, as much as possible, be kept in a *conical* shape. The *head* should be kept light by shortening, not entirely removing the *strong* boughs; the *stem* strengthened by the retention of all healthy branches which have been shortened, that the sap be detained, and may circulate more freely. Thus, we may put it out of the buyer's power to say, "this has been a *top-heavy* tree, 'tis all *shaken*; I cannot afford so much for it," &c.

3dly. THE BEECH will in no case admit of being trained otherwise than *upright*; nor is there a *valuable purpose* to which its timber can be applied, where it is not required to be *straight*: and it is a happy circumstance, that it admits of being trained in this position with great facility. In the character of ship-timber, it is required of vast length, exceedingly straight, and free from any kind of blemish.

4thly. THE ASH, BIRCH, SYCAMORE, &c. From what has already been advanced, it

is presumed, the reader may pretty clearly comprehend the subject of *Pruning*. Of the above, and all other *deciduous* forest-trees, suffice it to say, they are to be *trained* according to the purpose for which they may be intended ; whether for ship-timber, for the purpose of husbandry, manufactures, or for underwood.

5thly. THE LARCH. This tree, in few instances, requires *Pruning*. Like all the resinous tribe, its tendency is upwards ; but it differs from others in this particular : that if the leader, from accident, be broken or maimed, it will push a fresh one, even at a great age.

It frequently pushes twin leaders, and in this case, the *best* is to be retained, and the other destroyed, not by removing, but by shortening it near to the extremity. The stem thus *singled*, will grow vigorously, and the shortened *twin* will soon assume the appearance of a side bough.

It will also sometimes happen, that when a tree loses its leader by accident, *one* branch will assume, and perhaps *two* will strive for the ascendancy. In this case,

bends, well fitted for *ribs* or *knees*, are formed; which shows that this valuable plant, by aid of a little trouble, may easily be trained for ship-timber. A happy circumstance, since the wood is found little, if at all, inferior to Oak.

6thly. THE SCOTCH, SPRUCE, AND SILVER FIRS, &c. None of these require any other Pruning than keeping their stems single, when they happen to push twin leaders, the strongest of which is invariably to be retained. This is to be understood of trees standing in a close plantation, or in groups; but, in the character of detached trees, it may be necessary to shorten the extremities of such branches as grow long and slender, and which are unable to support their own weight; inasmuch, as they will frequently, if in good soil, push vigorously on all sides, to the detriment of the leader.

But it can never be proper to lop the branch of a Fir-tree by the bole. From the resinous juice which follows the tool at any season of the year, all wounds become, and continue to be, blemishes. When it

becomes necessary to remove a branch that is doing injury to plants around it, the best method is to shorten it back to the last pair of laterals or wings ; the remaining part will soon decay, rot, and drop off.

7thly. THE SEASON OF PRUNING young plants, or lopping of small branches, may generally be *the year round*. For large boughs, that is, of the size of the arm or leg, &c. *the fall of the leaf* is the most eligible time ; because, at this time, the wounded part does not crack, nor the edges of the bark shrivel or rag so much as in the spring or summer months. In spring also, and early in summer, many kinds are apt to bleed ; and the wounds of large branches, in that case, do not easily heal.

SECTION IX.

On Thinning.

THIS subject is of equal importance with that of the preceding Section. Pruning and Thinning should go hand in hand; and if the latter be judiciously performed, the former will be rendered the less necessary.

Thinning, however, is liable to restrictions, according to local circumstances, the situation of neighbouring plants, their value, and the value of the plants to be thinned out. This value may be considered in a twofold sense, as useful timber; as nurses.

But in *Thinning*, the consideration which should, in all cases, predominate, is, to cut for the good of the timber to be left, regardless of the value of the *thinnings*. For, unless for the purpose of filling up vacancies, if we have it in our choice to leave a good, and take away a bad plant, or kind;

and if it be necessary that one of the two fall, by leaving *which* of them shall we do most justice to the laudable intention of rearing timber for our own, or the good of posterity?

But, in order to prevent unnecessary repetitions, and that the subject may be more clearly followed, let us proceed with,

1st. THINNING OF MIXT PLANTATIONS.

And here, removing the nurses is the first object which generally claims attention. This, however, is to be cautiously and gradually performed; otherwise, the intention of *nursing* might be thwarted. If the situation is *much* exposed, it will be prudent to retain more nurses, although the plantation should be rather crowded, than when it is sheltered. In no case, however, should the nurses be suffered to overtop or *whip* the plants intended for a timber crop; and for this reason: in bleak situations, and when, perhaps, a certain nurse-plant can *hardly* be spared with propriety, it may sometimes be necessary to *bare one side* of branches entirely.—At a subsequent thinning, such plants are first to be removed;

and then those which, from their situation, may be dispensed with.

At what period of the age of the plantation *all* the nurses are to be removed, cannot be easily determined; and indeed, if the nurses are chiefly composed of Larches, it may with propriety be said, they should never be totally removed while any other kinds remain. For, besides that this plant is admirably calculated to compose part of a beautiful mixture with other kinds, it is excelled by few, perhaps none, as a timber tree.

But, when the nurses are formed of inferior kinds, such as the Mountain Ash and Scotch Fir, they should generally *all* be removed by the time the plantation arrives to the height of fifteen or twenty feet, that the timber trees be not drawn up too weak and slender.

Before this time, it may probably be necessary to thin out part of the other kinds. The least valuable, and worst thriving plants are objects of the first choice, provided their removal cause no blank or chasm; but in this case, namely, to fill up a vacancy, they

are to be suffered to stand till the next, or other subsequent revision.

At what distance of time this revision should take place, cannot well be previously determined ; but it had better be too soon than *too late* : from two to five years may, perhaps, with propriety, be fixed as the extremes, which may be regulated by difference of situation, the state of health, or age of the plantation in question.

But one invariable rule ought to prevail in all cases, and in all situations. Suffer no plant to overtop or *whip* another ; keep the extremities of all side branches *just touching* one another ; pay respect to *the distance of the tops*, not the roots of the trees : for some kinds require more head-room than others ; nor do all trees rise perpendicular, even on *level* or *sheltered* ground, to their roots.

In respect of the *final distance* to which trees, standing in a mixt plantation, should be *thinned*, it is hardly possible to prescribe rules : circumstances must determine. Whether they are to be suffered to stand till *full grown* ; which kinds the soil seems best to

suit; that some kinds require more head-room than others; whether the surface be flat or elevated; and whether the situation be exposed or sheltered, are all points of *particular* consideration.

But, if the plants are pruned and trained from infancy, and according to the directions given in the last Section, the rule above stated, of suffering no plant to *whip* another, and keeping the extremities of the side boughs *just touching*, will prevent a waste of *useful* land.

2d. GROUPED PLANTATIONS. And here, two queries occur: Whether the plantation be *simply* grouped? or, Whether it be mixt with *nurses*, with the intention of being afterwards grouped?

In the first case, it should be kept rather *thick* than otherwise, in youth; that the trees may, as it were, *nurse* one another. But, from the time it hath arrived to the height of from ten to twenty feet, according to soil and situation, due attention should be paid to *regular thinning*; that the trees may not be rendered unfit for any useful purpose for which they may be ultimately intended.

In the second case, the treatment is similar to that of mixt plantations until the nurses are removed ; with this difference, that the plants which are ultimately *to form the group* must, from the beginning, be regarded as the crop ; and the nurses, whether composed of one or more kinds, must be considered and treated as temporary trees, rendered subservient, and, in due time, giving place to the others ; from which time, *grouped* plantations of Oak, Elm, Beech, &c. are to be *thinned* according to the rules above stated. But,

3dly. PLANTATIONS OF SCOTCH FIR require a different management. The trees will need no other pruning than keeping the leader single : and to make them shoot tall, and push few side boughs in infancy, the plantation should be kept *much thicker* than any of the above, for the first ten or fifteen years ; proportionably so afterwards, though in a less degree ; observing to cut out *all* plants which have lost their *leaders* by accident, because such will never regain them so as afterwards to become stately timber.

Care must also be taken to prevent *whipping*; nor should the plantation be thinned *much* at any time, lest havock should be made by prevailing winds, which many, through inadvertency, have experienced. And this precaution becomes the more necessary, inasmuch as Scotch Firs, intended for useful timber, should never be planted except in exposed situations and on thin soil.

It may be worthy of remark, however, that after a certain period, that is, by the time the plantation arrives at the age of fifty or sixty years, it will be proper to *thin more freely*, in order to *harden* the timber; and that, then, this may be done with less risk of danger, from the strength the trees will now have acquired, than at any prior period, provided it be done gradually.

4thly. PLANTATIONS OF SPRUCE should be kept much *thinner* than those of Scotch Firs. This becomes necessary from the nature of the plant; it being apt to grow more *coniform* than the preceding, and likewise, to assume a very sickly appearance, if it enjoy not a freedom of space. Nevertheless,

for encouragement of an upright growth, and that the plants may not shoot too much to side branches, they should be confined to moderate distance in youth ; increasing it as they advance in age and size.

FINALLY, Let the *exposed margins* of all young plantations be kept *thicker* than other parts ; in proportion to the degree exposed, age of the plants, tenderness of the kinds, &c. ; and, let the *frequency* of *thinning*, and also the distance of the respective plants, be determined by the *general vigour* of the plantation.

SECTION X.

On the Treatment of Wounds, Bruises, and other Casualties.

1st. OF WOUNDS IN PRUNING. By the *system of pruning* set forth in Section VIII. it is shewn, that *lopping of strong branches* becomes not necessary; and that all *wounding*, in pruning, should be performed on, or towards the extremities of boughs which have inferior laterals to partake of, and divert their luxuriance of growth from injuring the stem or leader. It is also shewn, that, from this mode, *little ill* is to be apprehended, and consequently, that the treatment of such wounds is simple. True; and so much the better for the plant and the interest of its owner. Such wounds require no other attention than being lopped clean off with a sharp knife or bill; and, if the saw is used, being afterwards smoothed with the knife.

And it were to be wished, for the sake of *much* timber, which otherwise might have been rendered more valuable, that wounds

of another description had been unnecessary, or had never been inflicted.

I here allude to the necessity of lopping by the bole, all stumps, &c. occasioned by formerly injudicious pruning, and the wanton folly of those who lop large branches by, or near to the stem, when simply shortening them at a proper distance would answer a better purpose. But, since it becomes necessary, to clear formerly-injured trees, of stumps, &c. in order to prevent farther decay, it also becomes our duty to follow the most rational and simple mode of treatment.

With this view, I shall briefly observe, that, whenever it becomes necessary to lop a stump by the bole, or to shorten any branch larger than the wrist or ankle; in the former case, the wound should be to the quick, that is, to the level of the bark on the stem at least; and in the latter, *obliquely* across the branch, so as, from its position, to prevent moisture from lodging: being careful to prevent laceration, by notching the bark underneath, before the amputated part fall down, or to one side.

In both cases, the face of the wound and edges of the bark are to be made perfectly smooth with the knife ; and in a few hours after, or so soon as they are quite dry, let the wound be carefully plaistered with tar, (such as is used for sheep-smearing,) or laid over with white or blue lead, which has been well mixed up with oil, and rendered rather thicker than is commonly used for painting. The tar is, however, certainly preferable, being of a more healing nature ; and, if laid on in a thin state, it is not so apt to scale off by the action of the weather, as the paint.

This operation, as has already been mentioned, should be performed in the *fall* ; at which time, the wound is not so apt to crack, and likewise dries sooner than at any other season. If, however, in the course of the ensuing summer, or at any subsequent period, the tar or paint is found to rend or scale off, care must be taken to renew and keep the plaister sound and smooth, until the bark grow over and cover the wound ; and this should be more particularly observed in respect of wounds on the trunk.

In the case of *polling* a tree, lopping an upright branch, or, in training for Ship-timber, stopping the leader, &c. when, from the upright position of the wounded part in question, plaistering or painting, as above, might be deemed insufficient to prevent water from penetrating, and of consequence, injuring the trunk; it will be found necessary, after laying over the wound with tar, &c. to *cap* it with lead, wax-cloth, or *tar-pallion*, which may be fastened with *slate-nails* or *saddle-tacks*; observing to keep the *cap* in good repair, by examining it frequently, and laying it over with pitch or paint.

2dly. OF BRUISES, FRACTURES, &c. It is a lamentable fact, that much valuable timber has been ruined by inattention to accidental bruises and fractures; and much, also, has been ruined by want of attention to *prevent* bruises, &c. How often do we find *unfenced* detached trees, and those standing in open woods, in a state of irrecoverable decay, proceeding from the pernicious rubbing of cattle on their boles!

Did the owners of these trees but reflect

how far such bruising is injurious to the timber, and *their own interests*, they would not abandon plants not sufficiently advanced in growth, and covered with strong outer bark, so as to be unaffected by such rubbing, to a fate which never fails to produce their ruin. The trifling expence of fencing detached trees, or the value of the herbage in woods, can never counter-balance the loss thus sustained.

For, not one tree in ten, after being rubbed, (in the rising of the sap, perhaps,) is ever found to flourish, but languish, and finally decay. And how can it be otherwise, without an extraordinary exertion of nature, if, by this rubbing, the outer and inner barks are separated from each other, and also from the wood, and if the sap-vessels are distorted and broken? We might as soon suppose, that although the wrist were bared to the bone, the hand or shoulder would remain unaffected.

For such wounds, it may be very difficult to prescribe a cure; but it is in the power of every one to prevent the necessity of it.

We frequently see trees wantonly bruised

by the wheels and frames of carts, coaches, &c. In this case, although we may venture to prescribe a remedy, we certainly have also to lament its being necessary; inasmuch as scars on the bark, or blemishes in the wood, unavoidably follow, though the tree may, in most cases, resume its wonted vigour.

We have certainly also to lament the necessity of applying a cure to bruises and fractures, not unfrequently occasioned by the violence of prevailing winds, in tearing off the boughs of some, and throwing other trees down in such a manner as to bruise or maim those left standing. This misfortune we cannot prevent; nor at all times, that of maiming trees, in thinning of grown woods which have been neglected, and where they stand close together.

It therefore becomes our duty, *first*, so soon as a fracture, from whatever cause, occurs, to cut *in* to the quick or sound wood, to smooth both it and the edges of the bark, and, when sufficiently dried, to lay the wound over with thin tar, as formerly di-

rected. If an upright bough, or the leader, be the object of this care, it will be necessary, for the insurance of a successful cure, to *cap* it with lead, &c. as also above directed. And, *secondly*, so soon as a bruise on the trunk occurs, to examine whether the bark *only* be wounded, or whether the wood be also affected; for it will often happen, that an oblique stroke will simply *peel* the *bark*, without injuring the *wood*.

In this case, smooth the edges of the bark with the knife, wipe the bared part dry with a woollen cloth, and apply tar as above. But if both bark and wood are bruised, let them be previously smoothed with the knife, &c. then apply the plaister; which forthwith keep in such condition as to prevent the penetration of moisture. Nature will not fail to do her part; the wound will soon be covered with fresh bark, if health and vigour prevail.

Thus much as to fresh wounds or bruises. Let us now consider the necessary treatment of such as have been neglected, and by which

the signs of mortification and decay are produced.

And here we are certainly much indebted to Mr. Forsyth, for his hints on this subject. But although he deserves the fullest credit for his ingenuity and perseverance, in the composition and application of his plaster; I am inclined to think he might have been equally successful, and yet have spared himself much trouble.

We cannot suppose that this plaster, more than any other composition just calculated to exclude air and moisture, and to resist the action of the atmosphere, can have the *magical charm* of making a seemingly dead stump shoot forth and produce sound timber.

If we find a simple ingredient, devoid of any pernicious quality, to answer this desirable purpose equally well, are we not justified in the use of it, provided it can be as easily procured? Whether shall we expect, that a simple extract, which is to be employed in the cure of a vegetable, or a composition of animal, vegetable, and mineral matter, would be most safely applied?

Perhaps either with equal safety. Granted : and with equal effect too, as has been repeatedly proved.

I would now beg to know, whether this *celebrated* composition be better fitted to exclude moisture, and resist the action of the atmosphere, than a simple ingredient which has been used for ages past, both by sea and land, and for which we have not yet found a substitute equivalent, namely, tar? And I would also beg to know, which of the two is most easily procured, either with respect to expence or trouble; which would last longest when applied, or keep best in readiness against accidents?

I have no objection to powder of alabaster, wood-ashes, or bone-dust; but have found fine sand, brick-dust, or sand produced by rubbing a chip of free-stone with the finger, as useful, effectual, and durable.

In fine, it is a matter of indifference whether the wound be laid over with Mr. Forsyth's plaister, tar afterwards strewed with sand, &c. or any mild paint. If air and moisture are *effectually* excluded, the effect is the same. But, by using tar, much trou-

ble is spared; because, it is not so apt to scale off as paint; nor, in case of the necessity of renewing the plaister, does it require the pains of scraping and brushing the edges, &c. for mouldiness never follows when tar is applied. Coal-tar is to be preferred; it acquires a close, glossy skin, and is exceedingly durable.

We are not, however, to deviate from Mr. Forsyth's directions of "preparing the tree properly for its application, by cutting away all the dead, decayed, and injured part, till we come to the fresh, sound wood; leaving the surface of the wood very smooth, and rounding off the edges of the bark with a draw-knife or other instrument, perfectly smooth, which must be particularly attended to."

And it is really astonishing what exertions nature will make in the recovery of health and wonted vigour, if this first trouble be followed up with necessary care to prevent the bad effects of lodging moisture, until the wound is completely covered over with new bark. And although the wound will unavoidably cause a blemish in the wood at the

part affected, yet by this treatment, infection, or the farther decay of the rest of the tree will be prevented.

I know there are some who scoff at the idea of using plaister of any kind, urging for argument, that the bark grows as fast together of itself without this aid, and, why bury, in the heart of the tree, a load of rubbish ? But they certainly have not considered, that a decayed part of the vegetable being buried in its heart, cannot possibly again be renovated, or become sound timber ; but on the contrary, must operate to the corruption of the rest.

And this question, why bury in the tree a load of rubbish ? leads to a decision in favour of using tar, since, besides that the body inclosed is quite thin, it is of a genial, healing nature, acts as a cement to the fracture, and afterwards becomes equally sound as the wood.

And this may be demonstrated by examining Fir-trees which have been wantonly hacked *deeply*, had holes bored into them for fastening gates to, which have afterwards been removed, and above all, in the operation of extracting rosin ; in all which cases,

the wound is closed up by the resinous juice of the tree, and generally becomes perfectly sound as the rest of the wood, although a blemish may be the consequence.

Wherefore, with respect to resinous trees, nature prevents the necessity of our interference in the cure of wounds, other than the fracture of limbs; which it is certainly our duty to amputate, in order to prevent farther decay and unsightly appearance; but she will hastily cover the wound with a plaster superior to any we can prepare.

3dly. OF INCIDENTAL CASUALTIES. By which is to be understood, the *rot*; *knots* or excrescences; *shakes*; the baneful effects of Moss, Ivy, &c. growing on the trunk or branches; and the *worm* in Fir-trees.

THE ROT may be occasioned, *first*, by outward wounds, for which a remedy has already been specified.

Secondly, by the tree growing in spouty soil, whose larger roots have been injudiciously hacked at the time of transplanting, or in cutting out a neighbouring plant. In this case the disease affects the pith, eats upward, and often consumes the heart to such a de-

gree, while the bark remains in a perfectly sound state, that the trunk is enfeebled, and easily broken. This is demonstrated by cutting affected trees at different ages, and the rot is generally found less or more advanced upwards, according to the size of the cavity.* The remedy here is, be at all due pains to prevent the cause, by carefully draining the soil of poisonous, ochry water, and when necessity occasions the cutting of large roots, treat them in the manner of an amputated branch.

Thirdly, the rot is also frequently occasioned by stagnant water lodging in the angle formed by the stem and an upright

* A very curious instance of this species of rot occurred at Wemyss Castle in 1795. We were thinning a wood, whose trees consisted chiefly of Elm and Ash. In one part of it, the soil was observed to be spouty, and the Elm trees rather in a sickly condition. Every Elm tree we cut in this part was less or more affected; some were rotted a foot, others two, three, &c. feet upwards, and the wood above, to the extremity of the bole, was uniformly sound, and sold at two shillings a foot. One beautiful Ash-tree, in particular, was sold standing, at the rate of half a crown a foot of timber; nor was there the smallest outward blemish from the ground to the very top. When it was cut down, a complete, ready-made *Pump*, fifteen feet in length from the ground upwards, was discovered, and actually, as I was afterwards informed, applied as such.

branch; or in the angle formed by rival stems, when no actual wound has ever been made; but, which often happens, if the tree be in a youthful, vigorous state, a cup or hollow is formed, resembling that between the thumb and finger half opened. Here the water lodging, in time penetrates the bark, and forms the first receptacle of corruption, which, being once begun, advances apace.

The first thing necessary towards a cure, or prevention of further injury, is to clean out the water, (for which a syringe may be useful) dust, &c. and dry the hole well by aid of a mop or woollen cloth; then fill it up, until it run over, with tar; after which, fix on an apron of thin lead, in such a manner as that its edges may reach about a foot upwards on each limb of the tree, be joined close, and fastened with *saddle tacks*, &c.

KNOTS, or excrescences, are frequently found on the boles and branches of trees, particularly of Elms. What may have occasioned them, in many cases, is not easily accounted for; but it is sometimes obvious, that they proceed from bruises, or the maltreatment of trees in youth. In this case,

we frequently find them hollow within, and full of water, which, if not removed, will of a certainty induce the *rot*.

When the *knot* is quite entire on all sides, and perfectly sound, which may be known by striking it with a mallet, it should be suffered to remain. But when it is found hollow as above, it should be sawn clean off, the wound should be smoothed as already directed, cleaned, dried, and laid over with tar, &c.

SHAKES are a disease in timber for which no cure lies but in the prevention of them. What has been advanced in Section VIII. on pruning the Elm, prevents the necessity of a repetition here.

THE HURTFUL EFFECTS OF MOSS, IVY, &c. growing on trees, must be evident to the most superficial observer. The former is generally occasioned by a stagnation of air, in thick woods, and may be partly remedied by judicious thinning. But if it proceed from the sickly state of the tree, and if this state proceed from ungenial soil, the best remedy is to remove either the cause, or the plant. Another kind may thrive in its place; but first improve the soil.

It is in the power of every one to prevent the latter from being hurtful. Ivy is not a plant which finds a *nidus* on the bark of trees; it only finds *support* there. Many knowingly suffer it to remain, for the gratification of romantic humour; let us hope they also know it is injuring useful timber, which they may easily relieve.

THE WORM in *growing* Fir-timber is a disease for which there can be no cure, except in the draining and improvement of the soil. Indeed, this disease is not known on soils congenial to the nature of the plant; nor does it ever appear until the tree become sickly, by its roots having *touched a canker-ing bottom*.

It has been supposed this worm is the same with that which is found in deal, &c.; and some have thought it always generates in the tree while living; and that the sudden decay of Fir-trees, supposed to be by the worm, is in consequence of an unknown cause. I beg to differ in opinion respecting this matter; for I have investigated and found this sudden decay to be in consequence of the animal perforating the bark in an incal-

culable number of places, from the ground upwards; and also, that the trees are *never afflicted with the worm until they become sickly from another cause.*

This cause undoubtedly rests in the soil. For, in one instance of investigation, where a whole stripe of Scotch Firs, except the outer row on one side, were in a state of decay, and *wormed*; I found this row of healthy trees standing on a bank of free, gravelly, loose mould, and the others languishing on a thin turf, with a wet, tilly bottom. Wherefore, the cure for this disease is obvious.*

* Since writing the above, I have learned a curious fact respecting this matter. Some years ago, many Scotch Fir-trees, of considerable magnitude and value, belonging to the Earl of Leven, in the county of Fife, were observed suddenly to decay; and in the course of a year or two, to become quite *leafless*!

They were found to be *wormed*, and to waste apace *on their limbs*; much faster than felled timber does when suffered to lie among rank herbage, &c. Yet the soil on which the plants stood is a gravelly sand, and the sub-stratum, a loose rubble! *Stagnation of air* has been supposed, and with great probability, to be the cause of this disaster; as the plantation was much neglected in respect of *timely thinning*. The situation is low, and lies in the wane of a marsh (formerly a lake) from whence much damp and fogs have been observed to rise.

CHAP. V.

ON PLANTING HEDGE-ROW AND DETACHED TREES,
POLLARDS, &c.

SECTION I.

Preliminary Considerations.

OF the propriety of planting hedge-row trees at all, opinions vary *much*. That they are hurtful, in a certain degree, to *corn lands*, is generally acknowledged. But that they are universally serviceable to grass and pasture lands, will readily be granted. And since, *in a tree's lifetime*, it is probable the field may be as much under grass as corn, I am rather, on this account, biassed in favour of *planting*; independent of the *improved-like face* it puts on a country.

But the just cause of complaint against the injury sustained by corn-crops, may partly be removed; *first*, by proper training;

secondly, by proportioning the inclosures, &c. according to exposure and situation.

A universal, and *partly just*, objection, however, prevails against planting hedge-row trees by the sides of public roads, whereby they are kept damp, and consequently, *wear faster* than they otherwise would. The objection is only *partly just*, inasmuch as the evil might be removed, although the *north side* of all roads running East and West, or nearly so, were planted, and the South side left unplanted; that the air and sun might have full influence upon them, and dry them.

But the propriety of planting detached trees in parks, lawns, &c. cannot be disputed. The object, in this case, is to form a beautiful picture, and trees must unavoidably enter into the composition.

That the *execution of the piece* may be speedy, art has industriously been employed in removing and transplanting trees of very considerable magnitude. This has been attended with various success, according to the care bestowed, the quality of the soil, and the situation in respect to shelter. But the ge-

neral result seems to decide in favour of planting trees *under ten feet in height*; because, *first*, they are removed at a moderate expence; *secondly*, they are got up with better roots in proportion to their tops, than plants of greater size; and *thirdly*, the wind cannot act so forcibly upon them as on larger trees.

But the *medium size* of plants, intended either for single detached trees, small groupes of two or three, or for hedge-row timber, may, perhaps, with propriety, be fixed at *five feet* in height. These, and indeed *all* plants intended for this purpose, must previously be kept in training; otherwise, success will be rendered doubtful. That they be trained near to the place where they are afterwards to be planted, is obviously necessary; both on account of saving expence in carriage, and that their roots may be exposed to the weather as little as possible.

In many cases, neighbouring plantations may afford a source sufficient of plants for this purpose. In other cases, a conveniently situated Nursery becomes an object of consideration. But, in *all* cases, it is

necessary to determine on the planting of hedge-row and detached trees, at least one year before the work be put in execution, that they may be trained, and their roots prepared, in order the better to insure success.

In the case of planting hedge-row trees around the fences of arable fields, there is a time which may be deemed *more happy* for that purpose than another, namely, the *first* season of such fields being broke up from pasture; because, if they undergo a rational management, they will probably be kept in tillage some years before they are again laid down; and, in the interim, the plants will advance apace, and before cattle are again *turned in*, the tops will generally be beyond their reach. Neither will it be requisite to *rail off the trees* till this time; nor, to prevent the cattle from injuring the tops or branches, will it be necessary to place the rails *so far out*, or occasion so great a waste of land.

But, in the case of planting detached trees, the *proper time* is exactly contrary. It would give much trouble, in the operations of ploughing and harrowing, to avoid a number of new-planted young trees, which might be

injured even by the bite of the cattle in passing them. Wherefore, the most proper time to plant, is after the park is drained, improved, and laid down.

Nor will *ordinary* skill in transplanting be generally found sufficient. There is a wide difference between planting a small and a large plant, in respect to necessary care and attention, not only in the act of removal, but also in the preparation.

SECTION II.

On the proper Kinds for Hedge-row and detached Trees; Nursing, and preparing them for Removal.

1st. OF THE KINDS. For hedge-row timber, the Oak, the Elm, the Beech, and the Ash, may be esteemed the most valuable; to which, if ornament be studied, may be added, the Horse-Chesnut, the Sycamore, the Lime-Tree, the Poplar, &c. The Oak, in this situation, would become excellent ship-timber, if properly trained for the pur-

pose ; so might the Elm. But no tree, in the character of hedge-row timber, becomes so soon *graceful* as the Beech, or afterwards maintains such unrivalled dignity in bleak situations. The Ash becomes hardy timber ; but is trained with some difficulty, and gets *knotty*.

For detached trees, the Oak, the Elm, the Beech, the Birch, the Sycamore, the Lime-tree, the Platanus, the Poplar, the Willow, the Horse Chesnut, the Spanish Chesnut, the Service, the Hawthorn, the Holly, the Walnut, the Larch, the American Spruce, the Weymouth Pine, &c. may all be planted according to taste, and will generally succeed. But those which may be expected to become most graceful in this character are, the Oak, the Beech, the Sycamore, the Lime-tree, the Horse Chesnut, the Spanish Chesnut, and the American Spruce.

2dly, NURSING. Until the plants are four years old, and have stood two seasons in nursery rows, the reader is referred to the Third Chapter of this work, whether in respect to the preparation of a Nursery, or the treatment of the plants. It will there be found,

that, *generally*, all trees intended for the purpose here in view, are directed, at this time, to be moved into fresh nursery rows. Here we take up the subject.

Supposing that, at this time, the ground has been duly prepared; that the plants have been trimmed, and planted out into rows about eighteen inches asunder, and six or eight in the row;—let them remain here for *two seasons*; observing to keep clean of weeds, and to point up the intervals of the rows, at the end of the first year; also, to prune the plants, according to the rules given Chap. III. Sect. II.

Now, prepare a piece of moderately enriched land for the plants, by sub-trenching and breaking it fine, to the depth of about eighteen inches. Here plant them in rows thirty inches apart, and twelve in line. Keep clean of weeds; and, at the end of the first season, point up the rows and prune the trees, as above. Let them remain a second year.

Then, remove them into a piece of well-made, *rich* land; planting at about thirty inches each way, and previously *gently trim-*

ming the larger roots, to make them put forth small fibres. Let the head be also pruned, if necessary. Keep clean of weeds. Give plentiful waterings in dry weather; and,

At the end of the season, if carefully lifted with all the roots and fibres entire, with what mould will easily adhere to them, and, being carried gently in a mat, &c. they will be fit to plant out. But, if they are required of a larger size, let them stand a second year; at the end of which, move them into ground, as above, planting at a yard apart each way.

Observe, however, that all plants of this description should be moved into well-broke, *rich land, the season previous to final transplantation.* This is a surer pledge of success than any improvement yet discovered in the art of transplanting; provided it be followed up with the necessary care of *lifting the roots entire*, keeping the top *in due proportion*, and placing the plant *properly*. The cause is obviously, that the plant is thus encouraged to produce new *fibrey* roots; and these being carefully raised, retained, and placed

in free, kindly soil, are better fitted for seeking pasturage for the immediate sustenance of the top, than lank, *fibreless* bare roots are.

Sdly. PREPARING FOR REMOVAL such trees applicable to this purpose, as stand in, and can be spared from young plantations, may frequently save much expence and labour. After having determined on the plants, and the time of removing them, (which should be one or two seasons hence,) if they have never yet been pruned, this operation becomes first necessary; therefore, perform it according to the rules already laid down, endeavouring, as quickly as possible, to bring them into proper form; nor fix on others than will *obviously* answer the purpose, and which stand thin and unincumbered.

The first consideration now is, whether the trees in question are tap-rooted plants, and whether they have been *planted*, or *sown* on the spot. They require a different treatment.

In the first case, by the process of transplanting, their roots will have been *tapped*; and they may be treated indiscriminately with others, in the following manner:

A full year before they are intended to be removed, let a trench be dug out, a foot in width, to the depth of all the roots, and at a distance of from one to three feet from the stem all round, according to the size of the plant; allowing the extremes of height to be four, and ten feet, making the *ball* from two to six feet in diameter. Lay the good surface earth in one place, and the bad, or bottom earth, in another. With a round-pronged fork, work gently into the sides of the *ball*, until the ends of the larger roots be exposed a few inches. Dress them smooth with a sharp knife. Fill in the trench with the surface mould laid aside, and with mould gathered from the adjacent surface; rejecting the bad earth, and treading all gently with the foot.

But, for plants which have never been *tapped*, besides the above treatment, it is necessary, when the trench is thrown out, to *heel* the plant over to one side, and cut its *tap*, or any roots which tend downwards; observing, at this time, to remove a few inches of the bad, and replace with good earth, that part immediately under the *ball*.

Set the plant upright; fill in the trench, as above; and press the *ball* downward with the foot, or by a gentle beating.

At the end of one, or of two years, they will be ready for transplanting; but this depends on circumstances: according to the size of the plant, the quality of the soil, and the nature of the season. A small plant will, generally, have made fibres sufficient to sustain it, at the end of the first year; whereas a large plant, in a dry season, and growing on poor soil, will not.

If the plants in question are intended for pollards, it will be necessary to *poll* them the season previous to removal; but, in this case, the roots should have been dressed the year preceding, that *too much exertion* be not requisite.

But this custom of *polling*, seems rather to border on *the barbarous*; nor is there, for insurance of success, the smallest necessity for it. If we may hazard a conjecture, it is more than probable, the first introduction of this practice arose from the too frequently mis-shapen trees, found in open woods, applied to this purpose, and which have never

been pruned, or have been pruned injudiciously.

But if trees, intended for this purpose, are properly kept in training a year or two; kept light in the head, upright, and single in the stem; there can be no good reason assigned for lopping them over entirely. If shrubs or bushes are required, why not plant them?

All being ready, the plants are to be raised in this manner—Throw out a trench, *beyond* that thrown out in tapping, &c. quite as deep, and somewhat wider; *bare* the surface of the *ball* until the roots appear, using a round-pronged fork; clear the trench to the bottom all round; work under the edges of the *ball*, so as to be below all the roots, as far as the spade can go; if not now quite loose, apply two or three broad-faced levers, by which gently raise up the *ball*, a person disengaging the roots with the spade; raise it to the level of the adjacent surface, by thrusting through the levers or spokes; divest it of all loose particles of earth, which, by falling in the carriage, might break off fibres. I now proceed to

SECTION III.

The Manner of Planting; future Care, &c.

1st. MANNER OF PLANTING *. If the soil is sufficiently deep to receive the *ball* within the level of the adjacent surface, and if the bottom be not tilly, or canker-ing, make a *pit* sufficiently large, according to the diameter of the *ball*, that there may be a free space, all round, of ten or twelve inches *beyond* the extremities of the roots; keeping the good earth by itself, and laying aside the bad. Let the pit be made so deep, that there may be placed, under the *ball*, a few inches of the good earth. But, if the soil be shallow, and if the bottom be tilly and cankering, make the pit no deeper than the surface earth or sward, except so much as to receive a few inches of good mould under the *ball*, as above.

* For the season of planting, see Chap. IV. Sect. V.

The *pit* being now ready, and the plant in the situation as supposed at the end of the preceding section, let it be brought forward—no matter how—provided it be with care. Perhaps it may be carried in the hand; may be placed in a mat, and carried by two people; may be carried on a hand-barrow by two, and the top supported by a third person; or a sledge may be required, according to its size and weight. But the less friction it experience in removal, and the shorter time the roots are exposed, will be the more to its advantage.

Whatever pruning may be necessary at this time, let it be performed while the plant is in the hand, that is, before it be placed on the carriage, &c. But, prune cautiously, for fear of accidents; rather, as it were, refer the finishing till the plant has struck root and has begun to vegetate.

Place the plant upright, fair on its bottom; spread out all the roots in their natural position; *trindle* in the best surface earth, previously breaking it small; with the hand, lay out the roots, tire above tire, as they issue from the trunk, packing them with the best

of the mould, as you would pack carrots among sand, in storing them; when the roots are all covered, which should lie perfectly horizontal, tread the whole gently with the foot; if the earth, and also the season be dry, pour on water until you think it has penetrated to the bottom; proceed with the next plant, &c. until the surface be dried; and then finish the whole, by leveling in the rest of the mould, so that the surface of the pit be raised a few inches higher than that of the circumjacent ground, treading all firm as you proceed.

If the soil is shallow, and if the pit has been made only a few inches deep, the process is the same, with the difference of raising and extending *a larger hill*.

If a dry season ensue, it will be necessary to *water* frequently, perhaps once a week. That none of it may be lost or misapplied, it will be prudent to form a kind of bason round the root of each plant, by raising a small bank to retain it; and in some cases it may be proper to make a few holes with a stick or iron crow to aid its descent to the bottom. The whole being covered with

mulch or litter, would tend to prevent the surface from cracking in parching droughts.

Whether the plant may require *supports*, will be determined by its size, and the *exposure* or *shelter* of the situation. But plants under ten feet, if treated in all respects as above, will seldom be found to require them, and so much the better for their future welfare. Trees often receive much injury from their supports, both by their rubbing, and by bandages being tied too fast, or being neglected to be cut. If, however, supporting be found indispensably necessary, three poles being set up in a triangular form, *racked* with spars of wood at half their height to prevent friction, *bridled* at top, and the stem of the plant being fixed to the *bridling*, after having been previously wrapped round with straw-ropes or old matting, will, perhaps, be found as good a method as any other.

2dly. FUTURE CARE of Hedge-row and Detached trees after planting, until they are well established and trained into proper form, is a duty more expensive and necessary, in proportion to their value, than that attending close plantations.

This will appear at first view, when it is considered, that every single tree or small group must be fenced round. What materials the fence should be composed of, may be ruled by various circumstances. It may be of stone, of close paling, or of railing interwoven with brushwood, &c. But it should be such, *and kept in such repair, as that cattle or sheep may find it impossible to come at, or injure the plants,* until they are at least thirty years old. Indeed, sheep should never be suffered to come at growing trees. The oil or grease which exudes from their wool in rubbing is particularly injurious to vegetation*.

In respect to TRAINING AND PRUNING, it is presumed the rules laid down in Section VIII. of the preceding Chapter, being followed, and, perhaps, improved, may suffice for Detached trees. For Hedge-row timber, it may be necessary to remark, that as ornament is less an object than utility, it should be TRAINED FOR PROFIT; accord-

* Concerning which, see my ideas more fully explained in p. 302 of the Forcing Fruit and Kitchen Gardener. Third Edit.

ing to the demand, or probable demand of the vicinage, in the first instance ; or, for transporting to distant parts of the country, if it is of value sufficient to repay the necessary trouble and expence.

For the sake of the fence (if a live one) it should be observed, that all Hedge-row trees ought to be trained *to long stems* ; that is, of twenty feet or so. In this case, the hedge would be little, if at all injured ; provided also, that the *head* were kept light and taper, of kinds which *should* be trained upright ; or that, in training for *crooked timber*, the *bends* were made *at right angles with the line of the fence*.

Timely attention should be paid to *thinning*, that the fence may not be *smothered up* ; a circumstance not at all uncommon. At the same time, observing to *thin gradually*, especially in places much exposed, lest havoc be made by over-prevailing winds. For *Detached* trees there can be no-rule of thinning ; fancy *alone* must determine,

CHAP. VI.

ON THINNING AND PRUNING OLD PLANTATIONS WHICH HAVE BEEN NEGLECTED.

SECTION I.

The Advantages derived from timely and judicious Thinning; and the Disadvantages proceeding from Neglect.

THE ADVANTAGES are, 1st. Producing healthy, *sound* timber, and being enabled to *train* it for any useful purpose whatever from infancy.

2dly. In cases of *mixture*, by proper attention, being enabled to judge which kinds the soil suits best. This is done with less difficulty when the trees have full freedom of space than when they are suffered to run into confusion. The inclination of each is more clearly evident, being in this case *unforced* and disencumbered.

3dly. Being enabled to turn the *thinnings* to profit, in every stage of growth, of the plantation in question.

THE DISADVANTAGES proceeding from neglect, are,

1st. Unsightly trees; more particularly, after being singled out.

2dly. With much risk and difficulty *thick woods* are reclaimed, and the timber rendered hardy or useful.

3dly. When all the trees in a wood rush up together like so many maypoles, we are deceived in judging *which kinds* the soil suits best, and consequently, *which* should be retained. Because the bad may in some measure force the good kinds up for a time, although afterwards, by devouring their pasturage, they may occasion their decay; while we, perhaps, attributing it to the soil, cut out the good, and leave the bad plants, or kinds.

4thly. The *thinnings* of woods of this description are applicable to few purposes, perhaps only fuel or railing, while the *thinnings* of those, properly managed, whose timber is of good texture and quality, may be found useful in many intentions.

And it is matter of sincere regret that so many instances of such are found *all over the country*. How many thousands, nay millions, of trees are to be found in a state of almost irrecoverable ruin ! and which, at half the money the thinnings would have brought, might have been kept in proper condition in every respect, whether of Pruning, Training, Thinning, or in keeping up proper fences. How much more valuable would the timber have been, and of consequence, the property on which it grows !

But, in many instances, it is not yet too late to endeavour to recover many hundred acres of plantation, which otherwise, in a few years might be rendered very difficult to reclaim. The proprietors of such are therefore intreated to take this matter into their serious consideration, as being a point not only of *private*, but of national importance.

SECTION II.

The necessary Caution to be observed in respect of gradual Thinning, according to the State or local Situation of the Plantation.

THE *necessary caution* to be observed in thinning *neglected Plantations*, may be aided by the following considerations :

1st. The age of the plantation in question.

2dly. Whether it has ever been thinned.

3dly. Its situation—whether sheltered or exposed.

4thly. In what degree thriving.

5thly. Its composition—whether of valuable kinds, and in what quantity.

6thly. If a Fir Plantation.

THE AGE of the plantation to be thinned, may, in a great measure, point out the caution to be observed. If it is but a few years old, that is, under ten, and is comfortably situated in point of shelter, every freedom may be used in reducing it to regularity. If it is between ten and twenty years old, and

has never yet been thinned, it becomes necessary to be more cautious; thinning out perhaps only the half, or two thirds that might have been necessary to reduce it to regularity at first; and returning to *finish the thinning* the sooner.

If the plantation is above twenty, or about thirty years old, has never been thinned, and stands much exposed to the wind, great caution in the performance is requisite. In this case, not more than one half of the number necessary to reduce it into proper order should be removed at first; but in two seasons after, a fourth; and in other two or three seasons, another fourth part should be taken out; reducing it into order by degrees.

But plantations of this age which have been thinned, perhaps ten years ago, are pretty much sheltered, and are now again quite thick, may require less care in thinning their interior parts; although it may be proper to be cautious in thinning the margins. Indeed, the margins of all neglected plantations should be kept as a kind of barrier against the wind, until the interior parts are in some measure *hardened*.

Plantations above this age, namely, thirty years, which grow on pretty good soil, have grown fast, are quite in disorder, and stand much elevated, are to be gone about with the greatest possible care. In addition to thinning by degrees, as above, it may be necessary, after fixing on the trees to be removed at the second and third revisions, to prune many of them up to *almost* bare poles, in order to give place to the principals; when, at the same time, it might be hazardous to remove them entirely.

If the plantation in question be not in a thriving condition, according to its age; and if, which is often the case, it stand in want of *pruning* rather than *thinning*, it will be prudent to perform *that* duty on *most* of the plants; thinning out cautiously, until it be seen what the trees may do, or how far they may improve, in consequence. When the result is manifested, follow up the duty of regular thinning, according to circumstances, as above.

It becomes our caution, in thinning of *mixt* plantations, to consider its composition, the value of certain kinds, and their num-

bers; and it becomes our prudence to thin out the least valuable kinds first, provided it may be done without risk of danger. But many cases present themselves, where, to preserve regularity, and shut a gap which might become a funnel for the conveyance of wind, a better must give way to a worse plant, or kind.

In an extended plantation, a very different degree of *caution in thinning* may be necessary in one part, from that in another, although the composition or mixture be the same throughout. This may be occasioned by difference of soil, difference of exposure, or difference of respective health and vigour; and the rules for thinning should be varied accordingly.

FIR PLANTATIONS require to be cautiously gone about, particularly if they have never been thinned, and are tall. In this case, the plants will have long boles without any branches, except, perhaps, near to the top, will be top-heavy, and liable to be broken were the wind *let in at once* among them. Many plantations of this description have suffered much through inadvertency to this

matter; wherefore, in proceeding to thin such, or similar plantations, particular care should be taken to do it by degrees for several years, until they can finally be brought into order; observing to keep the margins, and any point *much exposed*, considerably *thicker* than the other parts.

But the degree of caution necessary, will ever vary with circumstances; nor can these be specified in every instance unseen. As experience is the best monitor, to those unskilled, or unaccustomed to the practice of *marking* and *thinning* of timber, it may be useful to remark, that the best way is to go over the plantation a *first and second time*, until they can bring it to their mind, or the degree of order necessary; *marking with paint in doubtful cases*, lest it might be found prudent to let a tree stand which had been *wounded incautiously*.

SECTION III.

Manner of Thinning and Pruning neglected Plantations.

IN this case, of *neglected* plantations, the operations of Thinning and Pruning become necessary at the same time. As these subjects have been treated in a particular manner in the IVth Chapter, and as the treatment of wounds, &c. has also been there enlarged on, it will be unnecessary to repeat the minutiae of performance here, farther than to point out, in a plain and brief manner, the most effectual method of RECLAIMING, and pruning into shape, such trees as have been totally overlooked or maltreated. With this view, let us divide the subject into,

1st. MIXED PLANTATIONS UNDER TEN YEARS OLD ; which may be reclaimed with little trouble or expence, and might forthwith be trained to any useful purpose.

If the trees have been planted thickly, that is, at three or four feet apart, according to situation and soil, and if the plantation has

risen well, it will probably require thinning, particularly if much *beeting* has been found necessary. This must be performed with the caution requisite, according to situation, and as hinted in last Section. But the nurses, if any were planted, will chiefly be the objects for removal. It may be thinned to the distance of from four to six feet, less or more, as the trees are situated.

But even this must be regulated by pruning up, at the same time, such plants as may stand, and have room, for some three or four years, until again revised.

Trees of this age may be pruned into form with facility, and without the aid of any other instrument than the pocket-knife and saw. Branches that are misplaced, or drawn out of form by being crowded, and which have not laterals conveniently placed to determine their being shortened, may be lopped clean by the bole without injury. Others should be stopped at about one half or two thirds of their length, and the tree pruned, as much as possible, into form, as recommended in the Section on Pruning, Chap. IV. Thus determining the distance,

by the rule of suffering no plant to *whip* another, and keeping the extremities of all side branches *just touching*, &c.

2dly. MIXED PLANTATIONS FROM TEN TO TWENTY YEARS OLD, and which have, till this time, been totally neglected, may be reclaimed and trained to any useful purpose, although, perhaps, with more difficulty than the preceding.

As in the former case, so in this, the nurses, if any were planted, become the first objects for removal; afterwards, the less valuable kinds, or such plants as are not found in a flourishing condition, paying all due respect to preventing the baneful effects of subtile winds, according to situation and exposure.

Next, endeavour to prune up the plants that are to stand, into proper form, as above, and regulate the *distance* accordingly; which, for plants of this age, may be, perhaps, from six to eight feet. In a subsequent revision, at the distance of, perhaps, three or four years, it may be possible to reclaim the plantation perfectly, as if it had been cherished

from infancy; but this is not *always* to be depended on.

3dly. MIXT PLANTATIONS ABOVE TWENTY AND UNDER FORTY YEARS OLD, which have never been thinned, &c. have grown well, and are now thickets, may still be reclaimed, although with considerable difficulty. In this case, the trees will be very tall and slender, and must be exposed to a freer air than they have lately enjoyed, with the utmost caution; nor will it be possible to reduce the plantation into proper order at the first, or perhaps a second thinning.

In this case also, it is probable, that many trees will have gained an ascendancy over the rest. These, unless they are of *bad* kinds, should be regarded and retained as the trees which, with the greatest probability of success, may be trained into proper form. For such as have been overtopped, in a perfect thicket for years, will be rendered so feeble, and have so few side branches, that they would neither be able to support their own weight, were they singled out, nor

would it be possible to reduce them into proper shape.

After having determined on the plants that are to stand, in the first instance, cut out the others a few inches under the surface; then return and prune up the former in the manner as already directed, with the difference of *lapping as few branches by the bole as possible*; that is to say, lop no branch that has got a lateral twig sufficient to lead on its growth, after being *shortened*. Thus, thin out the head, single out the leader, and endeavour to reduce the whole into a pyramidal form; at the same time, *not daring to touch the trunk*, unless absolutely necessary for the prevention of disease, or its appearance.

The second or third season following, it will be proper to go over the plantation again; thinning out such as were left as temporaries until this time, and pruning the principal trees *farther* into shape.

In two or three more years, it may, with proper attention, be possible to reduce the plantation into order, without farther risk of danger from the wind. At this age,

namely, about thirty years, the trees may be thinned out to from ten to fifteen feet, more or less, according to the richness of the soil, situation in point of shelter, and the vigour of the plants.

About seven years hence, (when the plantation will be about forty years old,) the trees will have advanced apace from the treatment they have experienced ; and may now be finally singled out to the distance of about *thirty feet each way*, more or less, according to circumstances, as above. At this time also, let the pruning necessary be performed, by sending a light person up to single out the leader, &c. which to keep in order, will forthwith be the only care required.

4thly. MIXT PLANTATIONS OF FIFTY YEARS OLD AND UPWARDS, which have either never been regularly thinned, or have run into disorder, are most difficult to reclaim. In this case, the branches have now assumed the appearance of lusty arms, and bear such proportion to the trunk, that to lop them off would be *exceedingly imprudent*, and to shorten them would make the trees look *very unsightly*.

But even *this* consideration ought to give place to *that*, if laterals conveniently situated are found whereat to shorten the branch, with the view of aiding or forwarding the upright growth of the tree, and bulk of the trunk.

However, if the tree, which is a common case, be divided into *two large limbs*, issuing from *a short trunk*, to which they bear very considerable proportion, it would be the height of absurdity to lop or shorten *the one*, with the view of forming *the other* into a proper bole. On trees of less magnitude, this may be performed, perhaps, with propriety; but on plants as large, or twice as large, as a man's body, the wounding of great limbs, such as the thigh, becomes a matter of *hazard*.

It were better, in the process of thinning, to take out plants of this description; provided, however, that, by doing so, *too great a blank* may not be formed, and that there be neighbouring trees of *value*, and with better formed stems, to supply their places.

In *thinning* plantations of this description, particular care should be had to prevent the

injury arising from boisterous winds, by keeping the margins, and all points *much exposed*, considerably *thicker* than the interior or sheltered parts. If the plantation is much overgrown, thick, and stands elevated, it may be found proper to set aside and prune up temporary trees, as above, (perhaps baring them of branches on one side entirely) in order to give place to plants deemed worthy of standing for good, and which, by removing the former at once, might be endangered.

At a subsequent revision, in a few years, such pruned-up temporary trees, and others of little value which can be spared, should be removed; thinning out the whole, as regularly as possible, to the distance of from thirty to forty feet, according to circumstances, as already hinted.

In plantations of this age, and, indeed, in all close woods, it would be imprudent to stub the trees up by the roots, which are thinned out; because, by doing so, the roots of those left standing might be injured. They will, long ere this, have extended their roots over the whole surface: many of their fibres

extremities will be intermingled with the roots of the plants to be cut, which, by being broke or wounded in the operation of stubbing, would be of considerable detriment to the growing tree, inasmuch, as from such fibrey extremities, which may be deemed the *purveyors* of the plant, its chief sustenance is derived.

In thinning of such plantations, also, it is a matter of very considerable importance, to be careful in not wounding the trees to be left, by the fall of those to be taken out. With this view, it may frequently be proper to saw off the larger extended boughs of plants to be removed, lest, in their fall, they might become entangled with the branches of those that are to stand, which they would not fail to injure.

A block and tackle, &c. may frequently be found serviceable, to aid the endeavour of laying the tree in such and such a position, and keeping it clear, in the fall, of the branches or bole of others. For, although an artful and skilled *feller*, provided the tree in question be pretty straight, and stand fair

on its *foot*, can almost to a certainty lay the *head* where he listeth; yet, if the bole be *crooked*, and the plant be in a stooping posture, it will frequently take very unexpected turns in the fall.

5thly. PLANTATIONS OF SCOTCH FIR sustain less injury by being kept too thick, especially in youth, than any of the preceding. Indeed, to produce tall, straight timber, it is necessary to keep all *young* plantations of Scotch Fir rather *thick* than otherwise. Wherefore, such as have been planted at about three or four feet apart, have risen well, and are under ten years old, should not be deemed *neglected*, provided attention to keep the *leaders single* has been bestowed.

Those about twenty years old, which have not been thinned, and which grow on tolerably good soil, will require to be looked over, otherwise they may soon be somewhat difficult to reclaim. At this age, they may be thinned out to about six feet apart in the interior, keeping the margin and parts much exposed rather thicker. Within the next ten years, thin them out, by degrees, to from

nine to twelve feet apart, less or more, according to the progress the plants have made, quality of the soil, &c.

Plantations of about thirty or forty years old, which have been suffered to run into disorder, must be gone about with care. The first thinning should be to about nine or ten feet apart; the next, within four or five years, to about fifteen or twenty; and a third revision, in eight or ten years more, should determine the final distance to from thirty to forty feet, according to circumstances, as above. It may be unnecessary to repeat, that such plants as have lost their leaders are the first objects for removal, provided no considerable blank be thereby occasioned.

Pruning, except to prevent *forks* in the leader, is unnecessary in any stage.

6thly. HEDGE-ROW TIMBER, which has been neglected or mal-treated, may be reclaimed in a great measure after a few years necessary attention to reduce the plants into form, by degrees. Trees, however, of this description, are often found so squat and bushy, if much exposed, that it would be next to impossible to shape them for tall timber. For

such, if, in kind, they come under the description of **SHIP TIMBER**, it is obvious what course to take, in order to turn them to profit. Others, which are found inclining upwards, although in disorder in respect of pruning, in time may be induced to shoot tall and straight.

It has been observed in Chapter V. that hedge-row trees should generally be trained to long stems of about twenty feet, &c. : but this is to be understood of young plants which have been properly cared for, or of such as are not larger in the bole than the thigh, or so. For it might be hazardous to dress up the stems of larger trees, especially those not in a very vigorous state of growth, inasmuch as the wounds might heal slowly, or with difficulty be covered with fresh bark.

However, for the sake of the *live-fence*, if crowded with under branches, the larger ones may be shortened back to the last twig or lateral of strength sufficient to sustain the vigour, and prevent the decay of the stump, provided the twig be not placed *within* twenty or thirty inches of the bole, or that the stem of the tree, in all probability, will never be

enlarged in diameter, *beyond* the extremity of the stump, so shortened; as, in that case, a blemish, or even the ruin of the tree, might be the consequence.

Instances of this are not wanting, in cases where, by the most inconsiderate absurdity, branches have been hacked off at, perhaps, the distance of a few inches from the stem, which afterwards has swelled beyond, and formed a kind of bason or hollow around the extremity of the stump, becoming a receptacle for water and the first seeds of corruption.

But to enlarge farther on *pruning*, might be deemed trifling with the reader's patience, after having said so much on the subject in this, and the two preceding Chapters. I therefore recommend *reclaiming and turning to profit*, in the manner most obviously practicable, all hedge-row and detached timber; humbly hoping the foregoing rules and hints may be found useful in determining the *form* of the trees, and their respective distances.

CHAP. VII.

MANNER OF CUTTING AND THINNING NATURAL
WOODS.

SECTION I.

Cutting in Hags for the Sake of the Bark, Fuel, &c.

THIS is the most prevalent mode of cutting Natural Woods, and in many instances, also the most profitable. In countries where fuel is scarce, perhaps the ground being occupied in any other manner whatever, would not produce a greater return. Add to this, the value of the bark of Oak and Birch, of which woods of this description chiefly consist.

The *wood* is divided into so many portions called *hags*, according to its extent, and the demand of the vicinity, which *hags* may consist of, from ten to an hundred acres

each. Smaller woods are generally done at one cutting.

The frequency of cutting varies with circumstances, being sometimes repeated in ten, fifteen, twenty, thirty, &c. years, according to the quality of the soil, exposure, state of growth, or opportunity of disposing of it to advantage.

The method of cutting also varies. Some leave *Stands* at regular, others at irregular distances, and some cut the whole *smack-smooth*; all which may be perfectly proper on occasions. But I am inclined to believe there is too much random-work performed.

The points for consideration, in order to determine *which* of the above modes should be adopted, according to the local situation of the wood in question, are, Value of fire-wood and bark, taken conjointly. Value of timber for utensils, and the purposes of husbandry, &c. Probability, by converting the wood into a timber-grove, of its future value, in the character of *ship-timber*.

In the following Sections of this Chapter I will endeavour to point out the most sim-

ple methods of cutting, with the view of speedily *rearing a close grove*, and with the double view of *cutting for timber and for underwood*. In this Section, I shall suppose the object of cutting is for fuel, and the bark; and that the whole is to be cut over, without any *Stands* being left.

The *hag* being marked off, and the season for cutting, which for Oak, is from the first of May to midsummer, being arrived; commence the operation by cutting clean over, close by the surface, such stems as issue singly from the ground. Those that spring from old stools which have been repeatedly cut, should be taken close off with the saw; observing to slope, and afterwards to smooth the face of the wound in such a manner as to prevent water from lodging. (See treatment of wounds, &c. Chap. IV. Sect. X.) But certainly nothing can be more erroneous than the avaricious practice of those who, for the sake of its bark, peel the whole stool down to the surface, and leave it to rot, to the evident injury of the succeeding crop of underwood.

For the information of those who may be strangers to the operation of *barking*, it may be proper to state the process.

Three classes of people are employed : the *hagmen*, or cutters, the carriers, and the *barkers*. The latter chiefly consist of women and children. The cutters are, or should be, provided with ripping-saws widely set, with sharp, light hatchets, and with short-handled pruning-hooks. The carriers should be provided with short ropes, stout limbs, and broad shoulders. The *barkers* are provided with light, short-handled, ashen mallets, the head being about eight inches long, three inches diameter in the face, and the other end blunt, somewhat wedge-shaped ; with sharp ashen wedges, somewhat spatula-shaped, and which may either be drove by the mallet, or, being formed with a kind of handle, may be pushed with the hand ; and with a smooth-skinned *whin*, or other landstone, the size of one's head.

The cutters are divided into two parties ; hatchet-men, who sever the stem ; and hook-men, who prune it of small twigs, and cut it into convenient lengths. The carriers bun-

dle the small branches (*all* an inch in diameter are barked) into their ropes, and bear them, the large ones, and the trunk, if lift-able by one person, to the barkers, who are seated on the grass at a convenient distance.

Small branches and twigs are held by one hand on the stone, and beat with the mallet until the bark be split, which is then stripped off, and laid regularly aside, as in reaping of corn, till a bundle of convenient size be formed. The trunk and branches as large as the leg, &c. are laid along on the ground; the upper side is beat, with force, from one end to the other; the bark is *started*, at the thick end, by thrusting or driving in the wedge, which, being run along the whole length, rips it open in an instant; the wedge is applied on both sides of the incision, in manner of the knife in skinning a sheep, observing to beat *before its point* with the mallet, until the bark is completely loosened.

Thus, a *skilful barker* will *skin a tree* or branch as completely as a butcher will a beast. But, the point most particularly to be observed in this art is, to take off the

bark in as long shreds or strands as possible, for the conveniency of carriage to, and drying it on the *horses*.

These are formed of long branches ; and pieces of a yard in length, sharpened at one end, and having a knag at the other to receive and support the end of the former. Two *knags* are driven into the ground at the distance of a foot from each other, until their upper ends are within thirty inches of it, and on a level ; other two are placed in like manner, at a distance suitable to the length of two straight branches, which are laid on, parallel to each other ; thus forming the *horse* *.

The *horses* may stand within four or five feet of each other, and are always to be placed on a dry, elevated spot, that the bark may have free air in drying.

At the end of each day's work, the bark is carried to, and laid on the *horses* ; across,

* Near to Loch Lomond, I lately observed an improvement in the construction of these *horses*. The poles were not placed on a level, as is commonly done, but the one a few inches lower than the other ; so that the bark, when laid on, had a considerable slope to run off the wet in heavy rains.

and to the thickness of about six or eight inches. The large, boardy pieces are set up on end, leaning against the *horses*, or being formed into small pyramidal stacks. Due attention must be paid to turning the bark once, or perhaps twice a day, according to the state of the weather. Good hay weather is good weather for *barking*. Gentle showers are beneficial; but long continued rains are productive of much evil; nor is the bark the better for being dried too fast.

A careful *hagman* will take pains to lay the strong boardy pieces of the trunk in such a manner as to shoot off the wet, in continued rains, from the smaller bark of the extremities; at the same time, preserving, as much as possible, the colour of the inner bark, and consequently, the value of the whole, by turning the natural surface outwards. For, it is chiefly by the high-brown colour of the inner rind, and by its astringent effect upon the palate, when tasted, that the tanner or merchant will judge of its value. These properties are lost, if through neglect, or by vicissitude of the weather, the inner bark be blanched.

When in a proper state, that is, completely past fermentation, if it cannot conveniently be carried off the ground and *housed*, the bark must be stacked. An experienced husbandman who can stack hay, can also stack bark. But it may be proper to warn him against building his stack *too large*, and to caution him *to thatch it well*.

The method of barking and treating the Birch, is much after the foregoing; with this difference, that the season is winter, or early in spring; and, that it is *more tedious*, by reason that the outward shreddy bark of the Birch is peeled off, and rejected. Wherefore, it follows, that if the wood in question is composed of Birch and Oak, and if the Birch is to be barked, the best method is to *time the work*, so as that the Birches may be cut, barked, and finished by the first of May; proceeding then with the Oak.

The wood, or *hag*, being thus cut *smack-smooth*, if it is intended for the same purpose again, it becomes a duty to bestow a little trouble in its future culture; and not, as is too frequently the case, abandon it to chance. *First*, cattle or sheep should be kept out; as,

by cropping the tender shoots, they retard its growth, and consequently, *a quick return of profit*. Secondly, to bestow a little trouble for three or four years, in going over the stools, rubbing off the superfluous spray, and retaining a moderate number of shoots, would hasten the maturity of the wood, for another *fall*, and return of profit.

If treated in this manner, and if the demand is for fuel and bark alone, a crop at the end of every fifteen, twenty, or twenty-five years, according to the strength of the land on which the wood grows, may reasonably be expected ; more profitable, perhaps, than at a greater age ; because, bark of this description brings the highest price.

SECTION II.

Reducing Natural Oak Woods into Timber Groves.

A MATTER, I humbly presume, which might be highly advantageous to the naval interests of the kindom.

It will obviously appear, that such woods as are situated in a maritime district, or in the vicinity of rivers which might become a means of conveying the timber, at small expence, to a convenient depot or market, are to be chosen for this purpose. I would earnestly recommend, to the proprietors of *such*, setting about, and as speedily as may be, reducing them into timber groves; regardless of the present gains arising from the practice of cutting, as in the preceding Section.

I will suppose the copse at any age under thirty years; taking, as a medium, fifteen. And at this age, considerable profits will arise from the thinnings; perhaps as much as

might defray the expence of future culture for many years.

If the copse has risen, from the last cutting, spontaneously, not having been cared for, it will probably now be a perfect thicket; and many *stems* will be found issuing from the same *stool*. Proceed first to mark, with paint, *the handsomest stems*, and so as that they may be left, as regularly as possible, at about five or six feet apart. Cut the others, if springing singly from the ground, two or three inches *within* the surface; if issuing from *stools*, close down, in a sloping manner, to the surface of the bark thereon; treating the wounds as directed in Section X. of Chapter IV.

The thinnings should be borne to the nearest convenient *clear ground*, and *barked*, as directed in the preceding Section.

Then prune up the stems left standing, according to the rules for pruning, Section VIII. Chapter IV.

The following, and for two or three successive years, care must be taken to destroy all shoots or spray which may be found issuing from the stools, &c. by rubbing them

off with the hand *before* midsummer, at which time they will easily be displaced. Also, to keep the wounds *in a sound state*, until they are skinned over.

The rules for thinning, Section IX. of Chapter IV. are to be strictly observed ; training to straight boles, until the tree hath acquired sufficient length of stem, perhaps thirty feet, more or less, according to circumstances ; after which, THE HEAD MIGHT be LAID OVER, for the formation of *bends* fitted for *ribs* or *knees*.

It might be prudent, however, that a want of *straight timber* for planking, &c. be prevented, TO TRAIN UP, perhaps, every fourth or fifth tree, *with light heads* (to prevent shading of those *laid over*) until of full maturity for felling. Or, it might be as convenient to appropriate a certain portion of the grove, from the time of *laying over*, to this purpose.

From the *strength of growth*, old stools of this description would produce on stems thus treated, we may fairly augur, *that this would be the most speedy of all methods to rear useful Ship-timber*. And it is well under-

stood, that *that* rising from spontaneous or natural *stools* is superior to planted timber. Of the above I have instances in my own practice.

SECTION III.

Cutting, with the double View of rearing Timber and Underwood.

EVEN in this case, SHIP TIMBER might be reared with advantage, in situations appropriate to the purpose. But I would *rather* recommend the foregoing method ; because, the *whole strength* of the *stools* being thrown into the timber-stands, it is obvious that a more speedy supply may be obtained. It is rather on the presumption, that, in certain cases, the double object of rearing useful timber for various purposes, and underwood for fuel, charring, bark, &c. may be found most productive, that the subject is thus distinctly treated.

For the sake of brevity, I will also suppose the copse is fifteen years old from the

last cutting, and that, at that time, it was cut *smack-smooth*.

Single out the best *stems*, as directed in the preceding Section ; leaving them, however, *at about ten feet apart*. Cut out the others, at a hand's breadth above the surface, if springing from the ground ; or close down to the surface of the bark, if issuing from the *stools*. Carry out and bark those cut, and prune up the stands, as above directed.

For three or four succeeding years, go over the *stools*, and reduce the shoots issuing from them to *moderate* quantity, by rubbing off the superfluous spray ; and, until the next *fall* of underwood, dress up the *Stands* every second or third season, keeping their stems *single*, and their heads *light and taper*.

At the end of fifteen, or of twenty years, make the first *fall* of underwood. At this time, also, remove *one half* of the stands ; which will be found necessary for the sake of the succeeding crop. They will now stand at the distance of about twenty feet apart. Dress and train them, as above, *for about twenty years*, and

Then make the second *fall*. Remove *one half* of the *Stands* at this time, which will single them, *finally*, to the distance of *about forty feet*. Henceforth, keep their heads light and taper, for the sake of the underwood; and

Continue to make *falls* every fifteen, twenty, or twenty-five years, according to existing circumstances, until the timber be of *full maturity*, when it may be cut down, and the above culture may be repeated.

SECTION IV.

Dressing of Old Timbers, standing irregular or detached, in Natural Woods.

AND here we may find many goodly trees, which, with little trouble, might be rendered valuable Ship-timber. By reason of their standing amongst underwood, their *stems* are generally elongated, and found clean and smooth, to the usual height to which the

copse is suffered to grow. Above this height, they are generally found squat in the head, and branching forth into large boughs. Might not the size and strength of those boughs which are *well placed* be *much* promoted, by checking the growth of such as are not, or removing them entirely?

But, after having, in the preceding parts of this Treatise, said so much respecting this matter, and the laudable endeavour of reclaiming, and rendering *more useful*, ALL NEGLECTED TIMBER, it might be deemed frivolous to enlarge more on the subject: A hint to the lover of his country will suffice.

CHAP. VIII.

ON SUB-DIVIDING LARGE TRACTS, BY BELTS, STRIPES, &c.

SECTION I.

*The Advantages arising therefrom, in respect of Shelter,
and improving the Climate.*

THE advantages to be derived, by subdividing extended Tracts of sterile, *exposed land*, with Stripes of planting, are manifestly great ; whether we view them in the light of affording immediate shelter to the lands, or in that of improving the surrounding climate. To all pasture lands, widely extended on open plains, the advantages, arising from being *properly* subdivided by belts of growing timber are both obvious and great.

The health of the animal, as well as of the vegetable kingdom, is improvable by the aid of shelter and genial warmth. In con-

genial soil, plants are made to flourish :— if aided by genial warmth—in a superlative degree. Who, at all conversant in rural affairs, does not know, that the *pasture-field* which is either *naturally sheltered*, or *sheltered by plantations*, is *prized higher* than that unsheltered, although the soil be equally good, or even superior in quality ?

If we enquire into the cause, it will be found, not only to depend on *an early rise of herbage*, by means of the shelter afforded to the lands ; but also, that cattle, who have it in their choice, in cold seasons, to indulge in the kindly shelter afforded them by trees, *feed the better*. Nay, we may safely presume, that no animal can fatten in discontent, or in an uncomfortable condition*. That the kindly *shelter*, and also the kindly *shade* of trees, are *comfortable* to pasturing flocks, may be demonstrated by watching their movements—in the stormy blast—under a scorching sun. How keenly will they fly

* Yet it is known that sheep sometimes fatten *in the rot*, until they grow up, nay, die of fatness. But, can such be wholesome ? May we not rather reckon this an accumulation of disease ?

to the shelter! How anxiously will they court *the shade!*

No doubt, from smothering up small fields, already comfortably situated in point of climate and shelter, with close plantations, there can few advantages proceed, especially while the fields are under *corn crops*. But, what relation has this to reducing widely extended, *bleak tracts*, into commodious compartments, whether of corn or pasture lands? It may be argued, that even the desirable or salutary effects of shelter may be produced, by simply planting *single rows* of trees around the inclosures. Granted, in many cases. But, in bleak, unsheltered situations, single rows are reared with much uncertainty of success.

But, by planting a stripe of moderate breadth, even on good land, is there an inch of ground *wasted*? What crop would ultimately pay better? Moreover, might not the margin of the field be as much shaded by the tops, or impoverished by the roots of a single row, as by a stripe of any given breadth? Might not the trees, in a single row, become as tall as those in a

broad stripe? and, might not their roots shoot as far into the field, as those in the outmost row of a belt?

For improving the climate of bleak, barren, extended plains; next to, or rather in conjunction with a rational culture of the ground, nothing can be more advantageous than the judicious disposal of plantations, generally denominated stripes or belts. On more varied surfaces, the disposition of these, together with clumps of different shape, as may best suit the situation in point, will frequently be found tending to this desirable purpose, namely, improving the climate; more especially, if *skill* be displayed in the disposition.

The good effects of shelter thus afforded will soon be visible, not only on the immediate, but on the more remotely situated lands. Wherefore, in the disposition, it becomes a matter of consideration, to place the clump, stripe, &c. so as to answer a twofold purpose, if conveniency will permit.

In many cases, according to situation, *waste corners* may be turned to advantage in this point of view, without encroaching

much on the adjacent *arable* lands : perhaps only so far as to afford good hedge fences, by touching on the better margins of the tilled ground ; or, in order to render *the whole* more agreeable to the eye, embracing part of a jutting angle, segment, &c.

In cases, which are not unfrequent ; where the surface is broken by crags, rocks, abrupt ridges, &c. it would certainly tend to the advantage of the estate, more than any other mode of culture, to plant such with timber trees ; independent of the benefit the neighbouring lands would afterwards reap, from the kindly shelter or shade of the plants.

In others, where the surface is broken by coal, lime, or iron mines, quarries, &c. and where the expence of levelling and reducing it into arable land might be great, it may be found more advantageous to plant as above ; keeping the double purpose of affording shelter to the adjacent grounds in view.

And in others, where the surface is broken by water-runs, pools, marshes, &c. to plant their margins, will frequently be found to tend to the advantage of the neighbouring lands, and afford the beholder much pleasure.

SECTION II.

The Direction, Position, Breadth and Extent of the Belts, Stripes, &c. according to local Circumstances, considered.

THE DIRECTION AND POSITION of stripes or belts may frequently be regulated by arbitrary circumstances; as, the limits or boundary of an estate, the position of public roads, the course of a river, ravines or chasms, abrupt precipices, &c.

When this is not the case, and where the choice is unrestrained, the leading points for consideration are :

1st. By what position the stripe or clump would have the best effect in opposing the wind; being placed *in its eye*, by observation of from what point, and with what effect, it generally blows.

2dly. By what position and direction it would most effectually answer the two-fold purpose of sheltering, and *conveniently* dividing the lands in question.

3dly. In what position a belting might be

run along, or near to the conjunction of tillable and untillable lands, so as to impair the one as little as possible, and at the same time, improve the other by the shelter afforded to its flocks.

4thly. In what position a stripe might be run through *pasture* lands, so as effectually to afford shelter, shade, and entice the flocks *naturally* to fold and rest, where their dung might either be collected for removal, or, being let remain, might be washed downwards by rains, to the improvement of the inferior surface of the field.

5thly. Supposing two contiguous estates, whose owners are mutually anxious to improve or adorn their respective confines : By what position and direction a belting might be run or produced, so as to improve or adorn the one, without injuring or disfiguring the other, reciprocally, in its progress or extension.

6thly. By what position or direction a clump or stripe might most effectually be run, with the double view of covering a disagreeable object, and improving the circumjacent lands.

These considerations may be found serviceable in many cases, in determining the position and direction of *useful* stripes, clumps, &c. But it is obvious, that no fixed rule or regulation can be laid down. An infinite variety of surface, situation, and exposure, prevents the possibility. Let us hope no one would place a clump, or run a stripe at random, without considering—of its *use* in the first instance—of its *value* afterwards.

THE BREADTH OF STRIPES, AND THE VOLUME OR EXTENT OF CLUMPS, according to local circumstances, may, however, be determined. Here I mean useful, not decorative stripes, &c., but such as are run, or placed with the intention of affording shelter to lands, which, by these means, may be rendered more valuable.

How often do we find this laudable intention rendered futile through niggardliness and inadvertency! Though we have to lament the latter, we cannot help condemning the former. To run a narrow stripe, perhaps of four or five yards in breadth, through an exposed, barren tract, is, indeed, *better* than to plant a single row; but a sin-

gle row, in a *sheltered* situation, may rise sooner, and more effectually afford shelter, than a *stripe* of this description, in a *bleak* exposure.

Wherefore, before proceeding to mark off the breadth of stripes, or to delineate clumps with this view, the situation, in conjunction with the quality of the soil, should be duly considered.

If the site is much elevated, the soil poor, and the climate unfavourable, the stripe or belt should not be made less than sixty or seventy yards in breadth. Nor should the mean diameter of the clump, provided it lie somewhat regular, and in a mass, be made less than double that breadth, viz. from a hundred and twenty to a hundred and fifty yards.

In more favourable situations, with a better soil, the breadth of stripes or belts may be reduced to about forty yards; and the mean diameter of clumps, to about an hundred.

But in no situation whatever, in the present point of view, should stripes be *under* twenty yards in breadth. Clumps or masses,

under an hundred yards mean diameter, are trifling and diminutive, and not worth the fencing-in.

In the present point of view, we are to consider, not only the value of *quickly rising shelter*, but also that of useful timber at a future period. Else, why should we bestow the expence of fencing, independent of that of planting and necessary culture?

By planting *narrow stripes* or *diminutive masses*, the proportional expence of fencing, and also that of future culture, is much increased. *Beeting*, each season successively, for many years, is requisite in cold situations; until the plants gather strength, and afford each other shelter. Not so, where a considerable mass, or a broad stripe is *properly* planted. The plants rise together in union, and keep each other in countenance from infancy.

CHAP. IX.

THE VALUE OF FOREST TIMBER CONSIDERED, BOTH
IN A PRIVATE, AND NATIONAL POINT OF VIEW.

FROM what has been advanced in the preceding parts, particularly in the first and second Chapters of this work, there remains little to be said on this subject here; other than, as it were, to wind up the account, or place in a just point of view, the *propriety* and *consequent advantages* of planting *useful* timber.

I do not here mean to speak to the value of trees in particular; nor to the *actual profits* arising from planting, which must vary in every district of the kingdom, according to demand and locality of situation. Every proprietor must be *so far sensible* as to this point, who has ever cut an acre of timber, or of underwood; and who has considered *the value of the land*, the *profits*, the *expences*,—and balanced them against that of an adjoining acre for the same number of

years, which has experienced an ordinary culture under corn and grass.

But I would wish to point out the *importance* and *value*, not only of planting and cultivating *young* timber, but also that of RECLAIMING, so far as may be practicable, *all neglected timber* throughout the kingdom. The former is highly commendable, inasmuch as it tends to provide for posterity an indispensably necessary and useful material ; which, perhaps, at a future period, may be *hard* to purchase in a foreign land. By the latter, much useful timber might be rendered serviceable to the present age ; and its *living proprietors* might witness the fact *in gladness*,—and see *much money spared to the nation* which is now paid for *imported* timber.

Without saying a word about the *probable scarcity* of SHIP-TIMBER at a future period, which it becomes our duty to prevent by all possible means, we certainly *feel*, and have to lament *the real scarcity*, not only of that, but of much domestic timber at the present time. But, are we conscious that foreign timber is superior in quality to that

of our own island, which has been properly cared for? Were it even so, should this diminish our anxiety, or make us less solicitous about a matter which is of the first national importance?

Nevertheless, while I wish to enforce the propriety of planting, and to hold out *the profits* to view, I would wish to discriminate between extremes. Although, it is probable, that all lands in the kingdom at this day, which lie under healthy timber, and are *fully cropped*, cannot be occupied to better purpose; yet it is also probable, that *too much* land of a certain description might soon be planted.

It becomes a matter of caution in the proprietor of an estate, to weigh well his particular situation, and consider duly of the soil and exposure of his lands, before he proceed to plant; lest, by chance, he be afterwards disappointed in the *expected value* of his crop. At the same time, it becomes him to consider probable circumstances, which at a future period might turn to his *particular* advantage; such as, the possibility of a navigable canal passing his way; the

probability of the establishment of an extensive manufactory, &c. in his vicinity ; and the like.

But, the proprietor of what are termed *waste lands*, be his situation, or the locality of the grounds what they may, should not hesitate a moment to plant ; provided also, it be plain, beyond all doubt, that the attempt to cultivate grain would be futile. Were *such waste lands only*, which lie in the vicinity of the ocean, of large rivers, and of canals, once planted ; independent of those of the same description which lie more inland ; our apprehensions of a future scarcity of Ship-timber might cease.

However, since the prevailing spirit of promoting inland navigation seems to increase, and diffuse itself over different parts of the island, who knows, in half a century, or by the time new planted timber shall have arrived at maturity, *where* the plantation may stand, whose *timber* will with difficulty be conveyed to a market ? Moreover, might not many cataracts and rivulets which pass *far* through mountains and steeps, be so

improved as to lighten the burden of carriage, if not to the Ocean or navigable rivers, part of the way at least?

Witness the wood of *Glenmore* in the Highlands of Scotland. Man is an active and enterprising being. Who could have divined, half a century back, that from *Glenmore* should spring a ship of war, and many goodly merchant-men; and, that *Spey* should be rendered the means of conveyance to the Ocean! Wherefore, let it not be said, "I am sensible, that although yonder hill would never produce crops of grain, nor is worth much for pasture, it might be made to produce good timber; but, were I even to plant it, where is the possibility of conveyance to a market?" &c. Who knows where even a city shall stand!

What district in the country is to be found of any considerable extent, where some parts might not, by being planted, be rendered more valuable? Is there even an estate of any considerable magnitude, in which the value of *some corner* might not, by being planted with timber trees, be enhanced?

The consideration of these questions is of importance to the individual—to the nation at large. Nor is it vague or frivolous ;

Inasmuch as it is universally known, that such estates as have a portion of growing timber upon them, when brought to sale, bring an extra price according to the quantity and value of the timber ; not only at the time of sale, but counting on its value at a far distant period. Thus, supposing the *half grown* timber on an estate to be valued at ten thousand pounds on the day of sale, instances are not wanting where twenty, nay, twenty-five thousand have been given, over and above the value of the land.

Such purchasers may justly be reckoned among the wise men of the world. They foresee the increase of wealth, proceeding from healthy timber growing where it may not only be cherished, till of full maturity ; but, which can then be turned to account, by reason of its local situation.

How different the ideas of those who imagine, that when once a portion of ground is appropriated to the planting of timber, it forthwith becomes a burthen to the estate !

No reasoning can be more erroneous; for, if a rational culture shall afterwards be bestowed, the profits, far within an ordinary life-time, will rise superior in proportion, to the best of its lands.

Numberless examples might be produced in proof of this; but in giving them, I should only tread the beaten paths of my predecessors and cotemporaries. Nor could such examples be altogether satisfactory; since time, place, kinds of timber, its use, demand, and many other circumstances must alter the problem.

However, I would wish to inculcate a just remark: That much depends on attention to, and management of the plantation, according to its local situation, in turning it *generally* to profit. That is to say, plant of kinds, and afterwards TRAIN THEM for fuel, for the purposes of husbandry, for manufactures, for machinery, for ship-timber; according to demand, or the probability of demand—of the vicinity—of the more distant parts of the country.

And having mentioned *training*, I cannot again help recommending, in the most ear-

nest manner, TURNING TO ADVANTAGE EVERY TIMBER TREE, particularly those which are adapted to Naval Architecture, with unremitting attention. How much have we to lament, and how great a loss to the nation has been, and may still be, the unpardonable neglect of much valuable timber; unless the proprietors and managers, *without delay*, shall set about, and endeavour to reclaim it, so as to answer some useful purpose, more effectually!

I have farther to take notice, in this general view, of the value of some component parts of timber trees not yet mentioned, namely, the barks of Oak and Birch, and the juice of resinous plants, as the Larch and Fir.

The value of *bark* in *tanning* is well understood all over the kingdom; and the profits are so great in some places, arising from copses of Oak and Birch, as *almost* to preclude the idea of cultivating timber of magnitude. This might be just, and even laudable, in some districts, namely, such as are situated inland, at a distance from rivers,

canals, &c. and where fuel brings a high price. But otherwise, it cannot be so ; inasmuch as the value of the land would be manifestly enhanced by the double culture of timber and underwood. See Chap. VII. Sect. III.

But there are certainly many thousand acres of natural Oak woods in the kingdom, particularly in the Highlands, which, by their locality of situation in respect to water carriage, might speedily be reduced into SHIP TIMBER, without *much lessening* their produce of *bark*.

With respect to the art of extracting the juices of *resinous* trees, which afford rosin, tar, turpentine, &c. and which commodities are well known to trading individuals, and the nation at large, by *the turn of cash* and the balance against us ; considering their *value*, it is surprising that farther endeavours have not been made by speculative men, to reduce to common practice an art so *easy* and *lucrative*.

As the process, however, is foreign to the subject of this undertaking, which is rather

to set forth the most simple and useful modes of culture, than the application of timber; and as it comes *rather* under the denomination of a chemical process; I forbear treating of it here, and also that of *charring*: being unwilling to lengthen this Treatise, already too long.

Having proceeded thus far, in a cursory manner, in taking a general view of the value and importance of planting and cultivating Forest Timber, and the advantages the nation *might* derive from A JUDICIOUS MANAGEMENT THEREOF; I shall conclude, briefly, by expressing my concern for the disadvantage under which we labour in respect to *the balance of the Timber Trade*; which is not only against us, but, perhaps, ere we can raise sufficient supplies, may be in favour of our enemies * !

* Lest the imputation of a want of confidence in our courage, valour, and independence, as a great nation, should seem to attach on the author, he begs the indulgence of remarking, that the above was written at a time when a general gloom sat on the countenances of all men;—when the Irish rebellion broke out—when Buonaparte sailed from Toulon—when it was reported that a strong French force had appeared off the coast of Ireland—in short, when a thousand unfavour-

Let us endeavour to avert so great an evil. Let us be assiduous in CULTIVATING AND RECLAIMING *that* by which we may be the better enabled to maintain our dignity and independence, and to protect and encrease our trade. Let the *real* wooden walls of Britain triumph !

able reports were in circulation, and when it seemed as if France were about "to assume the government of the world."

CHAP. X.

ON VARIOUS MODES OF FENCING.

Preamble.

ALTHOUGH this subject be, in some measure, foreign to that of PLANTING, yet it is so far connected with it, that a *Treatise on Planting*, without embracing at least one rational mode of *Fencing*, might be deemed incomplete. For it is not to be supposed, that when once trees are stuck into the ground, the business of Planting is finished; or, that they are afterwards to be abandoned to fate, without farther care.

But, how much cause have we for *censure* respecting this point! truly, too much. In many instances, we find plantations left *entirely unfenced*; in others, a mock ditch

or bank, not meriting the appellation ; and in others, a ragged hedge, or broken wall, with, perhaps, one yard up, and two down. Can this be called rational management ? Is it not the height of carelessness, nay, even a cruelty, to abandon trees, which, otherwise, might soon become useful, not only to the proprietor, but to the community, to the ravages of cattle ?

As, in different parts of the country, the *same* method of Fencing might, in many instances, be found inconvenient ; and as different modes may be found suitable in various circumstances ; I propose *three* different methods of *Fencing* ;—with the manner of repairing or reclaiming *old hedges*, so as to make them become, and continue to be, good fences.

I would wish to speak, in a particular manner, to the merits of the first * method ; *viz.* quick-hedge and ditch, with *top-dyke*. I certainly esteem it the best, the most speedy and effectual ; and that which, perhaps, is

* Invented by the late Sir George Suttie, of Balgone, in the neighbourhood of Edinburgh, and generally termed, “ Sir George Suttie’s Fence.”

more generally suited to different situations than any other.

A ditch is a matter of *conveniency* in almost every field, as it answers the double purpose of *fence and drain*. Where trees may be expected to flourish, we need not despair of rearing live fences—of quickset. While these are advancing, a low wall or *dyke* is placed on the bank formed by the excavated earth of the ditch. When the hedge becomes a fence, the wall *may*, at little expence, be removed, and made to answer the same purpose again.

A particular *conveniency* attends this species of fence. In most rugged places, such as are most frequently appropriated to *planting*, stones are to be found in great plenty, either lying on the surface, or in conveniently situated quarries. In certain cases the *dyke* may be formed of turf peats; in others, of rudely formed, *unburnt* bricks. But there are instances where even the best of bricks have been used, and with good effect: they are easily removed to another place, either for the same, or for other purposes.

It is observable, that, in this species of fence, the young quicks rise much faster, *comparatively*, in all soils and situations whatever, than in those without *top-dykes*. I account for it thus: The roots are bedded in the good surface mould *only*; by the pressure of the wall or *dyke*, the banking is consolidated, and the moisture determined to the roots of the plants; and the wall not only acts as a screen or defence against the wind, but reflects the rays of the sun upon the plants, greatly improving the immediate climate.

As, in many cases, the cutting down, plashing, repairing, and otherwise reclaiming of old hedges, becomes a matter of prudence, whether for the sake of the live-fence, for that of the brushwood to form dead hedges, or for fuel in places destitute of a supply of that article; I allot a Section for the purpose, in which I will endeavour to set forth the most simple methods.

For conveniency of situations, where, from the nature of the sub-strata, it may be found impracticable to make ditches; and

where the top soil is so poor and thin, that whether a hedge would rise quickly, or even thrive afterwards, becomes a matter of doubt; and where, from a superabundance of stones, it becomes prudent to rear stone walls *entirely*;—I allot a Section, on that subject; in which I propose treating of the various modes of erecting and coping them.

And, for conveniency of situations, where it would either be unprofitable or imprudent to plant quick-fences, and where stones are not to be found for the purpose of rearing walls; I allot a Section, on the method of building or forming mud and turf walls, and on planting aquatic hedges, &c.

SECTION I.

Snack-Hedge and Ditch; with Top-Dyke, Dead-Hedge, &c.

1st. THE AGE AND SIZE OF THE PLANTS is the first subject for consideration. For insurance of success, in *all* situations, it is indispensably necessary that they be well rooted, that is, furnished with a multiplicity of healthy fibrils. With this view, the plants should be taken from a seminary of *rich mould*, at the end of the first or second year, according to their strength; and nursed, also *in rich earth*, for one, or for two seasons at farthest. But in the latter case, they should be moved into fresh rows at the end of the first year. See Chap. III. Sect. II. On the Quick or White Thorn.

Plants of this age, and thus treated, will outgrow those of greater size in *any* soil or situation. This, by impartial trials, I have repeatedly proved; and the cause is obviously, that small plants, even by the *same* treatment, are raised with better roots in pro-

portion to their stems, than larger ones. In the choice of quicksets respect should be had to the *roots*, not the tops of the plants. Being nursed, the season previous to removal for hedging, *in rich mellow earth*; and being allowed sufficiency of room, kept clear of weeds, &c.;—is the best mode of preparation whatever.

But there is a double advantage in using young plants as above. They are cheaper—they are fitter for exposed situations than older ones; not because their tops are less bushy, which, since they are to be cut over about half their lengths before being planted, is immaterial, but because they have better proportioned roots to the size or strength of the stems, and, of course, are better fitted to seek pasturage for their common sustenance.

As above hinted, the stems of the plants should be cut over about half their length, or generally about six inches above the *ground-mark*. This may be performed by the hedge shears, or by gathering a handful *evenly*, laying them on a block, &c. and chopping them off with a hatchet. They should be carefully raised, and every the

smallest fibre should be retained. At all times, until replanted, let the roots be exposed to the air as little as possible.

2dly. FORMING THE THORN BED, AND LAYING THE PLANTS, follows next in course. Having fixed on the situation of the ditch, the side next the plantation or field to be fenced is rutted off by the line: The person rutting stands with his face outwards, and holds the spade in such a position as to form *the slope of the ditch* as he proceeds to the depth of the rut. If ley, pare off the sward, as thin as possible, to the breadth of a foot, all along on the side from the rut towards where the banking is to lie. This is *cleaning the scarcement* beforehand, and is done to prevent a rank growth of herbage the following season, which might do the young plants much injury, and occasion a deal of trouble in cleaning. If the land in question has been in tillage the preceding season, this will be unnecessary.

Now, run another rut along by the line, on the surface of what afterwards is to become the ditch, at a foot from the former. Go along, and notch the interspace cross-

wise ; keeping the spade in one position, so as to form turfs of about a foot square, and to the depth of the upper soil, if under six inches. Begin at one end, and turn these sods, *at one cast of the spade*, so as they may be inverted, with their edges at the distance of about nine inches from the first rut, or (now) face of the ditch ; keeping them exactly in line, and joined close to each other : thus forming the scarcement about nine or ten inches in breadth, which may be reckoned a good medium. In light sandy or gravelly lands, however, the scarcement should not be less than a foot ; as otherwise, the brink crumbles down, and leaves the roots too much exposed.

Now, lift another row of sods from the surface of the ditch, and throw them at random beyond, but not away from, the former. This is done to afford the more loose surface-mould wherein to bed the plants ; and where there is no turf or sod, is unnecessary. Go along the first row of sods ; smooth all inequalities ; and lay the surface in a gently sloping manner, so as that the roots of the plants may *dip* a little, and their tops may incline upwards,

when placed. Some lay them level ;—I believe it is immaterial :—their roots will soon seek downwards. The former, however, being attended with little trouble, seems more rational.

Place the plants, with their points about an inch *beyond* the margin, or edge of the sod towards the ditch, and at the distance of from six to nine inches apart, according to the quality of the soil. Cover them with some of the best surface mould from the ditch, until the bank is thrown up. The season of planting is, from the first of October to the first or middle of March.

I know many who, in all poor soils, bestow manure on their young hedges. *They have not done this in vain.* It is incredible what progress the plants make in consequence, and how much sooner they become fences. A little lime, marle, or reduced stable-dung ; or all these in compost, or any of these in compost with mould, will go a great way. In the application, the plants should be bedded among the manure ; previously sprinkling on a little earth, if rankish dung be applied.

3dly. NOW FORM THE DITCH, AND THROW UP THE BANK. The medium size I would advise is, five feet wide at top, two and a half feet deep, *perpendicular*, and one foot wide at bottom ; the sides being sloped *by a straight edge*, from the brink or lip downwards to the angle at bottom, without being swelled or rounded in the smallest degree.

There are other two sizes in ordinary practice ; viz. *the four-foot ditch, and the six-foot ditch.* Their dimensions hold the same proportion with the former, with this only difference ; that they are all a foot wide at bottom. Indeed, were any ditch of this kind made less, it would just be making it so much the shallower ; as the sides, by crumbling down, would soon fill up what it wanted in width.

In throwing up the banking, the remainder of the sod, and the good surface earth is to be carefully laid upon, and *immediately beyond* the roots of the plants ; while that of the under stratum is to be thrown beyond the whole, and so as to form a broad mound

to the height of a foot above the plants ; the face being laid *in a gentle slope*, and smoothed with the back of the spade. Tread the surface firm with the foot, and level it smooth ; then

4thly. PROCEED TO BUILD THE DYKE. Thirty inches in height, twenty inches wide at bottom, and fifteen inches broad at top, is the medium size. But they vary from twenty-four to forty-two inches in height, and of thickness corresponding, according to circumstances ; generally reversing the height according to the width of the ditch, except in some particular cases of inclosing pasture lands, where a *bold fence* is requisite.

The wall or dyke stands ten or twelve inches *back* from the face of the *thorn-bed*, according to the loose or retentive nature of the mould. And even this is a particular point : if it stand too far out towards the face of the ditch, it is not only in danger of slipping down, but the hedge is cleaned and dressed with difficulty ; and if it stand too far back, on the banking, cattle have the advantage, by reason of the space be-

tween it and the brink of the ditch, of scrambling over, before the hedge grow up, so as to obstruct them.

With respect to the materials of which the dyke or wall is constructed, it may be a matter of choice—it may be ruled by necessity. Flat, or square stones, are the best materials; as they lie solid, if of any considerable size. Bricks may, however, be equivalent, but are generally more costly; and now, on account of the high duty, cannot reasonably be expected to be used for this purpose. Next are, a collection of land stones, pebbles, &c. of the size of the foot or so, for the bottom part; and larger irregular shaped blocks, of the size of the head or so, for finishing with at top. But it is best, in all cases, to finish with a single stone, that reaches in breadth from side to side; as such bind better, and lie more solid.

I have even known *top-dykes* to be built with lime or mortar throughout; but, as the value of this material in the farm is now so well understood, it seems extravagant. In any case (and where it is necessary to use small stones, pebbles, &c. it will appear

most needful,) I should suppose, to *pin* or dash the surface with lime would be found sufficient; and also to keep the wall in a sound state, till the hedge became a complete fence.

The coping is generally formed of two courses of sod; the one inverted or laid green side down upon the dyke, and the other laid green side up upon it; being dressed in the edges, laid on while wettish, and made to project about two inches beyond the face of the wall on either side.

It has been said, in the preamble to this chapter, that in certain cases, the dyke or wall might be formed of turf-peats, or, rudely formed, *unburnt* bricks, &c. From what has been advanced above, it will not be difficult to conceive how to proceed with them. But the reader may see farther on this subject, in Section IV. of the present Chapter.

5thly. DEAD-HEDGE, OR RAILING, in cases where the above materials cannot easily be procured, or where the others abound, and are cheap, may be found good substitutes; and, if the soil wherein the hedge is

planted be tolerably good ; and if it be properly cared for, they may frequently last till the hedge becomes a fence.

The dead-hedge should be formed of the best of the brush-wood ; should be well intermixed, small and great together ; should be placed *upright*, just where directed for the *dyke* ; to the depth of a foot into the banking, and to the height of a yard above it ; from a foot to eighteen inches in thickness ; rammed hard together, and set firm and steady ; and, when finished, clipt top and sides, in a neat manner, that it be not displaced in cleaning the fence.

There are various modes of placing the *railing*. Some place it upright, on the top of the bank ; others on the outside of the ditch ; and some place a rail in either situation. But this latter cannot be proper, nor of any use whatever, in the case of fencing a Plantation. Our fear here lies all on one side, and is from without. A *sufficient* rail, being placed on the outward lip of the ditch, would certainly be *most effectual* ; but such seldom withstand both the rubbing,

and efforts of cattle to leap them, being too much on a level with the field.

Perhaps the most terrific manner of placing a railing of this description is, what may be termed, something in the *chevaux de frize* manner; that is, in choosing the rails, pick such as have many branches, and leave them as knaggy as possible, in projecting lengths of about a foot; drive the posts, not into the top, but into the face of the banking, a few inches above the plants, and in an inclining position, so as to form an angle of about 60° with the horizon. Nail on two rails, one a foot above the plants, and the other a foot and a half, or two feet above that; and thus, by the position of the posts, and the rugged appearance of the rails, will be formed a barrier which few pasturing animals will attempt.

6thly. THE MANAGEMENT AND FUTURE CARE OF THE HEDGE, now becomes an object for consideration. And here, I cannot help declaiming against those whose practice it is, when they have planted a hedge, never to give themselves any farther con-

cern about its welfare. No species of husbandry can be more erroneous, nor any case of neglect more censurable. The value of good and speedy fences, ought not to be trifled with ; more particularly in the present point of view, namely, *plantation* fences.

If cattle break into a field of growing corn, even though they may revel for a while, the damage is not deadly. They, perhaps, destroy little more than they eat at the time, which is, in so far, saving their pasture on the other side. But the case is widely different when they break the inclosure of a plantation, whose trees are not beyond their power of injury. Here, every bite is felt ; every bruise becomes a blemish ; and every wound an indelible stain ! In fine, not even the tomb of our forefathers should be held more sacred than the field flourishing with healthy and valuable timber !

Wherefore, that the hedge may succeed the decay of the railing or dead-fence, in the one case, and the downfall, or necessary removal of the *dyke*, in the other, *let it be cleaned and trained from infancy* thus :

Give it two, three, or four cleanings *with*

the hoe the first year, according to the cleanliness or foulness of the ground. At the end of the season, go over and replace with stout, well-rooted plants, such as have failed, that the whole may rise together regularly. This is a material point ; a hedge, although perfectly good and fenible *in general*, with here and there a gap, is, in fact, no fence at all. Cattle soon learn the path, and keep the opening which admits them without trouble. At this time also, scour out the bottom of the ditch, and dress the stuff to the roots of the plants ; which will not only keep the water-course clear, but, from its richness, being a species of vegetable earth composed of decayed weeds, &c. will add to their vigour.

Repeat this culture for two, three, or four more years, according to the progress of the hedge, until it become a fence ; keeping clean of weeds, as you would a row in the best kept nursery ; and scouring out the bottom of the ditch from time to time, as necessity may dictate ; dressing the stuff to the roots of the hedge, all along, as above.

When the hedge has arrived to the state

that one might say, "there's a good fence," it may finally be *scoured up*; and cleaning with the hoe may be withheld. But at no time whatever, if we look for *close bottomed fences*, should we desist from cutting with the hook, *every noxious weed* which may present itself *in front*; and which, if left standing, would not fail to weaken the *breast-work*.

The method of final scouring, is this: rutt, with the spade, in the face of the ditch, about half way down, and so as to form a shelf or scarcement between this rutt and the root of the hedge, two feet broad; point up the surface of the shelf or bench with the spade, that the mould to be laid on may mix intimately with that of the shelf; line off the opposite side or lip of the ditch, placing the line so far from the brink as, with the stuff now in the bottom, to afford a sufficiency of earth to make up the shelf to a level with the original *thorn-bed*; observing to give it a gentle slope from the bottom of the ditch, so as that its upper surface may be about eighteen or twenty inches broad, and that, when the hedge is full-grown and

clipt, (as under directed), a surface, *on the same slope*, from the bottom of the ditch to the summit of the hedge, may be formed. Dress the opposite side of the ditch handsomely, at the same time ; and,

Provided the temporary fence has been a dead-hedge or rail, let it now be cleared away. Let the banking be levelled down, and closed to the back of the hedge. But if a *top-dyke* has been the safe-guard, and if it is to be let remain standing, fill up the interspace between it and the hedge, to the level of the shelf in front.

It may be necessary to remark here, that if the ditch in question run along by the side of a public road, not only in the scouring up, but from the beginning, it should be formed in the sunk-fence or *ha-ha* manner ; that is, the side whereon the hedge stands, should be in all respects as above, and the other should be laid in an easy slope, from *nothing* on the side of the road, so as to form an angle of about 80° with the face of the ditch.

This becomes a matter of caution for the public welfare ; and this method should be

practised on the sides of all roads and lanes whatever. Many and dangerous are the accidents happening daily, by carts, waggons, and coaches being "*turned into the ditch.*"

With regard to TRAINING THE HEDGE, I will briefly observe, that according to its strength and progress the two or three first years, clipping is to be commenced ; that the sides only, not the top, are to be touched, until the latter is *regularly* about a yard high ; that then, *the hedge may be topt*, to make it *bush* the better ; and that forthwith, the sides and top are to be trained with the shears and bill, in such a manner as to resemble the *highly pitched* roof of a house, or the end of a triangular prism, whose base is *three*, and perpendicular *six feet*. Thus forming, as above said, one uniform surface from the bottom of the ditch to the extremity of the hedge ; lying in a gently reclining manner, about nine feet in height ; superior, *in reality and effect*, to the best wall of this height, in the kingdom.

From this time forward, *the care* turns on the other side of the balance. Hitherto, we

have been anxious to bring our fence to a pitch of perfection. Having accomplished it, we are now solicitous to preserve it so.

First, keep it clear of all noxious weeds or plants, as bramble, broom, whins, &c. which might encumber, or occasion gaps in its sides. *Secondly*, trim up the heads or branches of trees, which, by lying over, bearing upon, or shading, might injure the top. *Thirdly*, at each cutting, which should be twice a year, in the fall, and at Midsummer, *cut close in* with the intention of keeping it within bounds; whether in respect to the height, or to keeping the sides or wings from spreading too far outward, and shooting *beyond* the face of the ditch. And, *fourthly*, when this cannot be accomplished by the shears alone, use the hook and bill, to reduce the stronger upward parts into due bounds; performing this gently, and on *one side* at a time; because, by cutting both sides at once, and *much to the quick*, would occasion *just* what we wish to suppress, namely, an over-abundance of growth.

Hedges thus treated will last for ages; and, provided they are never suffered to run

much into disorder at any time, are neither tedious nor expensive in dressing. Well may they be said, at a distance, to seem "*living walls*."

SECTION II.

Plashing and Cutting of Old Hedges.

1st. **FLASHING** is an operation more or less understood by every countryman, bred in an *inclosed* district. The common method is briefly this:—

The stronger stems are selected, at as regular distances as possible, and generally at about thirty inches apart. These are called the *stakes*; and are commonly headed over at four or five feet above the surface, according to the general strength of the hedge in question, so as they may all range in line, and at one height. The more pliable branches and small twigs are interwoven, in the basket manner, among the stakes, from top to bottom, as closely as possible. Such as will

not bend, in a pliable manner, and afterwards remain in due position, are *snagged* half-through with the bill, to make them more obedient. The strong stems, that cannot be laid in, and are not wanted for stakes, are cut close by the surface. In places where stems strong enough, and fit for *stakes*, are wanting, the deficiency is supplied by *dead stakes*. After the *plashing* is finished, the hedge is dressed smooth on both sides with the bill, shears, &c.

We can have no reasonable objection to this mode, which is certainly the cheapest and most easily performed; except that the stakes, or cut-over stems, shoot forth strongly, to the detriment of the under part of the hedge, which, by over-shadowing, they retard in growth, and keep naked of spray.

This probably suggested an improvement, now pretty generally followed, namely, cutting *none* over at all, but *weaving in the tops of the stakes* along with the plashers. The propriety of this mode is at once evident; for, besides that the above complaint cannot possibly attach in this case, the stems cut by the surface send up a strong growth, which,

intermixing with the plashers, renders the whole more close and impenetrable.

In cases where two rows of quicks have been planted, according to a common method, at the distance of a foot from each other, the *back* row being plashed in any of the above modes, and the front one being cut down to the stub, would be the most effectual method of preserving the present, and producing a new fence.

PLASHING, however, can *only* be effectually and *handsomely* performed in cases where there is a good portion of spray and long pliable shoots or branches; and when the hedge has, if not youth, at least vigour on its side, to send forth a luxurious growth, and cover the naked appearance the *plashers* would otherwise have. For the more handsome performance of this business also, there is a season more suitable than another, viz. the *fall*, or beginning of winter. At this season, the shoots are more pliable than in spring, when the sap begins to rise and circulate; at which time the shoots of all plants are *most brittle*.

After the hedge is *plashed*, the ditch, pro-

vided there be one, should be scoured out, and dressed up in all respects as described in the preceding Section ; and, if the fence is properly attended to, in regard to pruning or clipping, as also there directed, it may last for many succeeding years.

2dly. CUTTING OVER OLD HEDGES is a much less expensive mode of renewing or reclaiming them, than the above ; and in most cases, is more commendable ; whether considered in the light of producing brush-wood for fuel, dead-hedging, &c. or in that of affording the opportunity of more effectually training and shaping it afterwards for a durable fence.

The manner of cutting must be regulated by circumstances—according to the age, the strength, the closeness of the hedge ; and whether planted in a single, or in double rows.

If the hedge in question be pretty vigorous, and branching towards the bottom ; and if the stems stand regularly and closely together, although the top be ragged and straggling, it may be brought into due subjection, without being cut down to the

ground. In this case, the sides are first to be *switched up* with the hook, not altogether close to the stems, but within a foot of them on each side at bottom ; tapering up close at the top, which should be from the ground about four or five feet, according as the height can be carried along most regularly from one end of the fence to the other. But if the hedge is *thin* at bottom, it will be advisable to cut better *in*, in order to make it bush from the ground upwards. However, the top should be kept as much in line, and on a level, as possible ; forming it into a ridge by the strokes in cutting ; and forthwith endeavouring to shape it in a manner as directed in the preceding Section.

If the hedge in question is *not regularly close*, but ragged, and full of gaps from end to end, the best method, in order to reclaim it, is, to cut it over within eight or ten inches of the surface ; to fill the *rootless* gaps with *stout, well-rooted* plants ; to point up the surface of the bank ; and to scour up the ditch, as above-directed. As it rises, be at all due pains in clipping and otherwise train-

it, as hinted in last Section :—it will grow apace, and will soon become a good fence.

If the hedge, in this case, is situated between the plantation and a pasture field, it will obviously be necessary, either to fence it off by a dead-hedge, or by a railing. But if the bounding field is newly broke up from pasture, and if it is positively to be kept in tillage for three or four years, nothing of the kind will be requisite ; as, if the hedge is properly managed, by *that time* it will again be a fence.

In other cases, where the hedge to be cut is getting thin below, too tall, and when the stems are placed regularly within eight or ten inches of one another ; and, when it is necessary to retain a fence, at the same time, cutting so as to have a supply of bottom spray ;—cut, alternately, the one plant to within eight or ten inches of the surface, and the other at four feet high ; dress the banking, and scour up the ditch, as above ; and forthwith train, and endeavour to bring the hedge into proper form, as soon as possible.

And lastly, in cases where two rows of

quicks have been planted, cut the *front one* by the surface, and the other at four or five feet high ; dress, and scour up the bank and ditch, as above. Thus will be formed a new hedge, backed with a living palisado ; which, for encouraging and giving place to the former, must be kept as such, by clearing the stems of all shoots on the side next to it, until it become a fence. The other may then be cut down ; and this will tend to keep the bottom of the hedge thick and close for many successive years.

The season of cutting, in any of the above cases, is, from the first of September to the first of May. But I cannot subscribe to *cutting over* a hedge, which is afterwards *to be trained for a fence*, at Midsummer ; although I have witnessed it in more than one instance. I hardly conceive this to be rational management.

SECTION III.

Of Stone Walls.

1st. WALLS BUILT WITH STONE AND LIME, next to *well managed* hedges, are the *most durable* fences. In many parts of the country, however, particularly where lime is scarce, they are erected at considerable expence; nor are they *generally* kept up for a trifle.

The dimensions of what may be termed *a good fence* are, twenty-four inches thick at bottom, twenty inches at top, and six feet high under the coping; which, if properly set on for a fence of this description, will raise it ten or twelve inches higher. The medium height, however, may be reckoned at a foot less than the above; and many are found even *two* feet lower: but just grounds of complaint against their effect, *as fences*, not unfrequently occur.

It may be unnecessary to say, that the wall should be *well built*; every honest

tradesman will see to that. But the position, that a *solid foundation* is not more necessary to the support, than a properly placed and *well set on coping* is to its preservation, may not have occurred to every one. The *coping*, to a wall of this description, is as the *roof* to the interior parts of a house. If water is not completely excluded, there can be little comfort within; so neither can the wall be in good condition, or stand long, after water is suffered to penetrate.

The mode of *coping* varies with taste; but I do not presume that, for a common fence, a finely dressed *hewn cope* is to be set on. I consider it an error to place any cope, so as that its surface may be *flat*; nor do I consider whether it *project* or not a matter of any importance. The virtue of every good *cope* is, to exclude moisture from penetrating the top, not preventing it from falling on the face of the wall. Wherefore, in whatever position the *coping* is placed, it becomes a matter of *caution* to make *good joints*.

The kind of *cope* which I conceive *most* advisable in the present case is, two *thin stones* set up in a triangular form, and in such

a manner as that their lower edges may join *just flush* with the face of the wall on either side : the one being lapped over the other, so as to cover the joint, and form a thin, sharp edge at top ; being well packed underneath, and joined close to each other lengthwise.

Next to the above, in cases where they can be procured, I would recommend a coping of calcined cinders (*danders*) such as are produced at glass-works, salt-works, iron founderies, &c. If formed in manner as above, and properly dashed with lime, it may be questioned whether they do not make the best *cope* of any. They adhere very closely ; from their porous nature, they imbibe the *new laid on* mortar, which, in this particular case, should be used *thin* ; and, from their varied and beautiful tints, especially those found at glass-works, the coping looks very gay. Being a calcination, their durability cannot be questioned.

I next advise, in common cases, and where neither of the above materials can be procured, a coping formed of large, somewhat irregular blocks, such as will reach across the wall from side to side ; whose

edges, though not smooth, will join well, and whose upper surfaces will admit of being formed in a triangular manner with little trouble.

But certainly, after being at the expence of building a *good* wall, the farther expence of placing upon it a *good coping*, is ill withheld. This should be considered before the work is set about ; for, provided a wall is set on a *fair foundation*, if *well coped*, although built of inferior materials, it will frequently be found to last longer than one built of the *best* materials, and *badly coped*.

2dly. WALLS BUILT DRY, that is, of stone without lime, and being afterwards *dashed* (*harled*) or *pointed*, will frequently be found durable fences, more especiall if due attention is paid to *coping them well*. This is a common mode of fencing in places where lime is of great value ; nay, many houses are *built* thus.

It will plainly appear, that in this case, even *greater* attention towards *setting on a good cope* is necessary than in the above. It will also appear, that since the wall is *less* solid, the lighter the *coping* is, will be the

more to its advantage; as by *little* pressure it will not be so apt to *shoot* as when burthened with a ponderous coping.

The *calcined cinders* above mentioned would be eminently useful in this case. Slates, either the *hard blue*, or the *grey*, or any durable *light stone* of the slaty kind, are next to be preferred.

But the common mode, especially in this case of *dry stone* walls, of *coping* with *sod*, is by no means advisable. It may tend to keep the uppermost stones together for a time, until water penetrate the turf; but afterwards, it is of mischievous consequence to the wall. The water, passing downwards, is lodged in its heart, and absorbed by the stones; when hard frosts ensue, it is drawn towards the lime on the surface, and when a thaw suddenly succeeds, loosens it and bursts forth.

3dly. DRY STONE WALLS ENTIRELY, are the most common of any, in parts where lime is hard to purchase. It may be unnecessary to say more of them, than, that the best endeavour *to set them well*, according to the given materials, or size of the stones,

should be used. The chief art in building the *Galloway-dyke* consists in *matching the stones at sight*, so as they may *bed* well, and hold together; for, the prices generally allowed on this species of building will not admit of *the tool* being used. In some parts I have observed a very handsome and durable method of erecting these walls; *viz.* building one half, or at least two feet, with flat slaty stones, and finishing with large blocks at top.

* It is observable, that a wall thus constructed, four feet and a half high, is equal to one six feet high with a plain, or a sod coping. The *sickle-coping* seems to intimidate sheep and cattle more than any other; and, I am persuaded, would be a most effectual one for deer-park walls.

SECTION IV.

Mud and Turf Walls, &c.

IN places where stones are not to be found for *fencing*, and where it might be improper to plant quick hedges, recourse must be had to forming walls of mud or turf. In many cases, *mock fences* of a ditch and loose random bank, formed of the excavated earth, are thrown up; which crumbling down in a year or two, are both ineffectual and occasion much trouble. In other cases aquatics, as Willows, Alders, &c. are planted as hedge-wood, sometimes on a bank thrown up as above, and at other times, by the side of a ditch on the plain surface; but not being properly cared for, and by their inoffensiveness they become an easy prey to cattle, get full of gaps, and are of no effect.

Instead of the above, and in order to have both an immediate and succeeding fence, I would advise making a ditch, and forming a *top-dyke*, in all respects as directed in Sec-

tion I. of this Chapter ; choosing *the six-foot ditch*, however ; thrusting Willow, Poplar, or Alder truncheons *down*, instead of laying them flat, as the thorns ; and building the *top-dyke* as follows :

Some months previous to the work being set about, dig a sufficient quantity of turfsods to face both sides of the *dyke*. Twelve inches long, six broad, and four or five thick, will be found a convenient size. They may be ranged along, at the back of where the banking is to lie, for conveniency. When ready to build, temper a quantity of mud from the ditch, in manner of mortar, but rather thinner. Clay, or a mixture thereof, would be preferable. Proceed to build the *dyke* as if it were a stone and lime wall, or rather, a brick wall ; *facing* with the turfs, *bedding* with the mud, and *packing* the heart with earth from the banking. From twenty to thirty inches at bottom, fifteen, or twenty at top, and a yard high, are the dimensions ; but these may be varied according to the size of the turfs, and other circumstances. When finished, lay on a single sod, *wettish*, and *green-side up* for a coping.

Walls thus built, particularly if the mud inclines to, or is for the most part composed of clay, will stand well, and last for many years. A little more *base* being given, they might be carried to the height of five or six feet, and would be good fences on plain ground.

And here an idea occurs: I have seen, in some parts of the North, a kind of turf wall built with sand, set on a low bank, not elevated above the common level, but formed by excavating, on both sides, the turf and sand whereof the wall is made. I have observed, for the most part, this kind of fence is made at random; that is, sometimes the face of the bank and the face of the wall form *one slope* from bottom to top, and sometimes a shelf is formed at the conjunction of the bank and wall. Might not a wall composed and built as above, being placed on a low, *solid* bank of this kind, and having *one continued slope* from bottom to top, at once be, and continue for many years a good fence?

In the present point of view, it would be more effectual than in the case above men-

tioned; because, in the one, the soil is supposed tenacious, and consequently would support the *dyke* the longer; whereas, in the other, being of a free, loose, nature, it soon crumbles down, to the ruin of the whole.

And this, probably, in the above instance, suggested the idea of forming a broader bank and shelf, as it is plainly evident, that by being continued on one slope without a *step* for cattle, it would be a much better fence.

Pity the idea of planting a quick-hedge did not occur, since this shelf or scarcement naturally became necessary! How many good fences might now have been flourishing in a certain district lying between the river Spey and the Murray Frith! Nor do I know, in *many instances*, a soil more apt for the purpose. But to return.

In cases where the soil is a strong, stubborn clay (and in such we cannot expect the *quick* to flourish) and where stones are not to be found for the purposes of fencing, walls of the above description being built with *well dried turfs*, and thin, *properly tempered* clay, would stand for many years. They might, however, be greatly improved

by intermixing *small land stones or river pebbles* amongst the strata of turf and clay.

I cannot omit remarking a species of mud wall I have seen on the river South Esk, of which are built many *pretty looking* huts and other dwellings. At a distance they seem built of brown bricks. It is composed of a muddy clay, intermixed with the roots of plants; and is dug from out the flood-mark of the river, in any size or shape, according to the purpose for which it may be wanted. The sods or peats are generally of the brick form, but larger. They are manufactured in all respects as peat-fuel. Some build them with lime, but they are more generally built with clay. The inhabitants prefer these huts to those of stone; "they are *warmer*," and are said to last for many generations. May not such mud occur in many places, were it searched after? If formed into wall-fences, as above, there cannot be a doubt of their durability.

With regard to the management of aquatic hedges, little remains to be said. If the ideas of the reader, respecting the importance of keeping Plantations *always well*

fenced, coincide with mine, he will endeavour to have his hedges of every description properly trimmed at all times. The Alder, the Birch, the Poplar, and the Willow, will admit of being clipped with the shears, and dressed with the bill; and although it is not necessary to dress hedges of this description so often as those of quickset, yet, repeating it once a year, particularly on Willow hedges, might even be profitable.

A *complete* hedge, four feet high, standing on the margin of a six foot ditch, will resist pasturing animals *in general*. Willows, being cut annually at this height, would make fine shoots for the basket-maker; and it is known that few articles pay better, though planted in the best of land, provided a little trouble is bestowed on their culture. It is not a common practice to clean aquatic hedges; but, while in infancy, that is, till three or four years old, one or two hoeings in the season would be *well* bestowed.

With these observations on *Fencing*, which are chiefly applicable to Plantations, I will conclude; hoping the hints and suggestions

thrown out in this Work may be found useful in the CULTURE of *young*, and in the RECLAIMING of *old* Plantations: a matter, I conceive, of very considerable importance to the Landed Interest, and to the nation.

PINIS.

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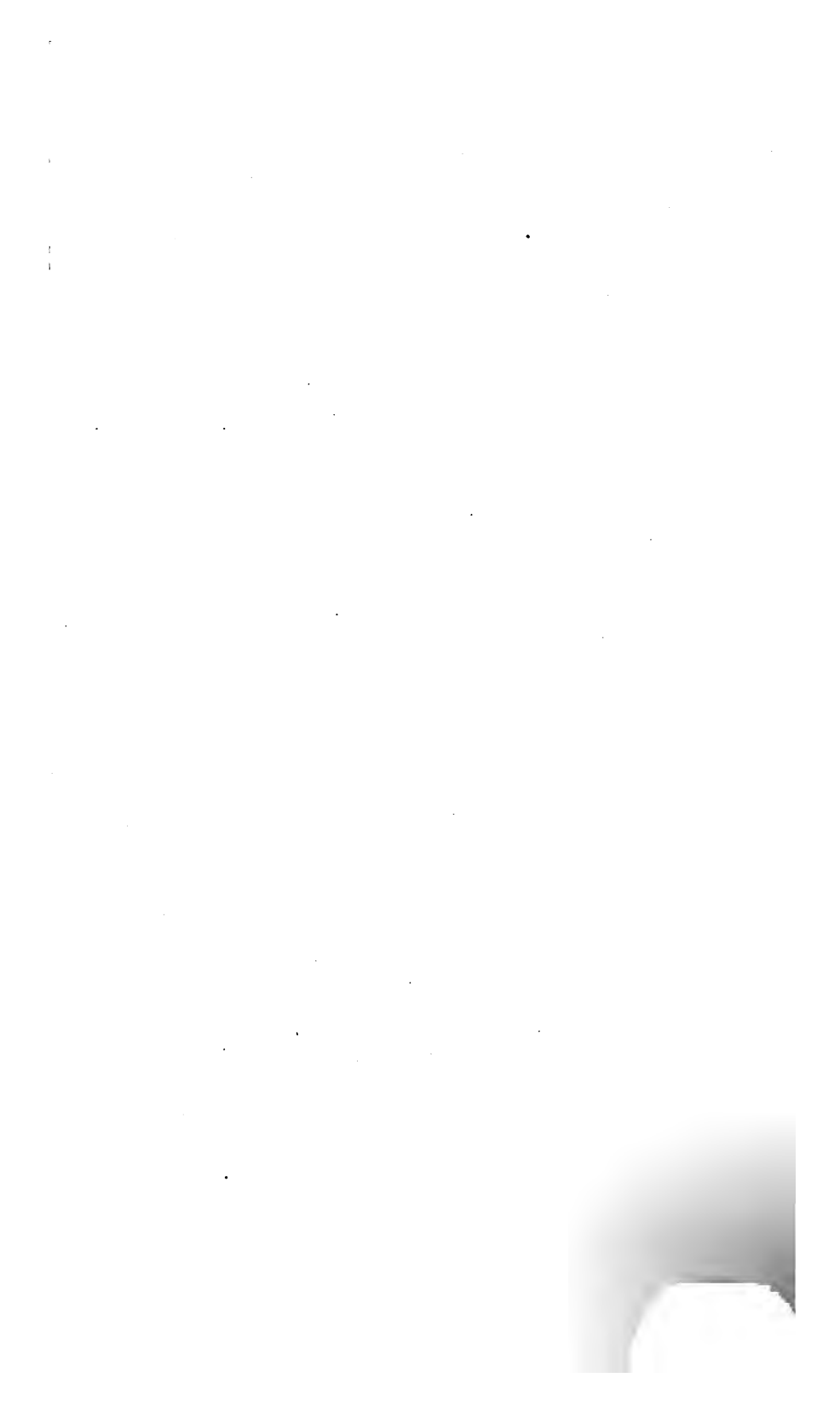
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